A Validated Set of MIDAS v5 Task Network Model Scenarios to Evaluate NextGen Closely Spaced Parallel Operations Concepts

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Executive Summary 1
The MIDAS Closely Spaced Parallel Operations (CSPO) Network 1
Scenario Identification 5
Scan Pattern Network 6
Probes and Alerts 7
Settings for Routing Tasks 8
Decoupling Event 10
Descent Network of Tasks 12
Approach Phase of Flight 20
PF/CA Approach Task Network Model 22
PNF/FO Approach Task Network Model 35
Land Phase of Flight 51
Equipment Definitions in the Approach Scenario 60
First officer Probes and Alerts 65
External Environment Features Definitions 66
Accessibility Definitions 66
Set 4D State Definitions 73
Set Wake States Definitions 74
Set Equipment by Scenario 75
Decoupling Event 77
Wake Vortex Attention Settings 80
Defining the Detect-Assess –Determine Response – Communicate sequence: 81
PF/CA Task Set to CSPO alert 82
PNF/FO's Tasks 94
Air Traffic Control Tasks 100
The Environment Model: Microsaint Sharp 106
Reverse Engineering the Task Network Model 116
The Reverse Engineered Model 117
RNAV No Pair 117
RNAV With Pair 124
VCSPA 200 131
VCSPA 800 137
ATC responsible Two-Stage Alert 143
ATC Responsible One-Stage Alert 154
Pilot Responsible Two-Stage Alert 165
Pilot Responsible – One-Stage Alert 180
References 195

List of Figures

Figure 1. Top level task network for the approach and divert scenario..... 4
Figure 2. Set number of runs and other simulation settings. 5
Figure 3. Scan pattern settings for the CA/PF in the approach and land scenario..... 6
Figure 4. Probes and alerts definitions used to drive the events in the scenario. 7
Figure 5. Settings for the routing tasks. 9
Figure 6. The task network of the decoupling event..... 11
Figure 7. The descent task broke into two paths, that for the PF and for the PNF/FO..... 13
Figure 8. PF/CA and PNF/FO tasks in the descent phase of flight. 14
Figure 9. PF/CA and PNF/FO tasks in the descent phase of flight involving the communication at 10000' from the PNF/FO to the ATC and the PF/CA hearing the communication. 15
Figure 10. PF/CA and PNF/FO tasks in the descent phase of flight involving the communication at 4000' from the PNF/FO to the ATC and the PF/CA hearing the communication. 16
Figure 11. PF/CA (top) and PNF/FO (lower portion) tasks in the descent phase of flight. 17
Figure 12. PF/CA and PNF/FO confirmation set of actions includes confirmation of TDZE. ... 18
Figure 13. PF/CA (top) and PNF/FO (lower portion) final tasks in the descent phase of flight.. 19
Figure 14. PF/CA (top) and PNF/FO (lower portion) bracket tasks to set the approach context phase of flight. 21
Figure 15. PF/CA tasks in the descent phase of flight. 22
Figure 16. PF/CA 'wait-for' communication clause in the approach phase of flight. 22
Figure 17. PF/CA confirmation of altitude in the approach phase of flight. 23
Figure 18. PF/CA speed confirmations required in the approach phase of flight. 23
Figure 19. Equipment settings and flaps actions required in the approach phase of flight context.24
Figure 20. Equipment settings and flaps actions required in the approach phase of flight context.24
Figure 21. Equipment settings and flaps actions required in the approach phase of flight context.25
Figure 22. Aircraft coupling sequence actions required in the approach phase of flight context. 25
Figure 23. Aircraft coupling sequence datalink actions required in the approach phase of flight context. 26
Figure 24. Aircraft EICAS check actions, and separation automation required in the approach phase of flight context. 26
Figure 25. Flaps 20 actions. 26
Figure 26. Confirmation of flaps 20 through attribute tests. 27
Figure 27. Gear down and throttle actions required by the PF/CA at flaps 20. 27
Figure 28. PF/CA Crosschecks and speed setting actions before NETEE waypoint. 28
Figure 29. PF/CA Tasks when aircraft has slowed to 146 kts. 29
Figure 30. PF/CA Speed brakes action sequence. 29
Figure 31. PF/CA confirmation of VNAV/LNAV mode. 30
Figure 32. PF/CA flaps 25 actions and cross checks. 30
Figure 33. PF/CA confirmation of flaps 30 settings. 30
Figure 34. PF/CA flaps 30 actions and cross checks. 31
Figure 35. PF/CA confirmation that landing checklist is complete. 31
Figure 36. PF/CA listen to runway clearance task..... 32
Figure 37. PF/CA tasks under 800 ft of altitude in either RNAV or CSPOs. 33
Figure 38. PF/CA RNAV tasks as Decision Height is reached. 33
Figure 39. Final PF/CA attribute test required prior to entering land phase of flight. 34
Figure 40. PNF/FO context setting tasks in the approach phase of flight. 35
Figure 41. PNF/FO clearance receipt tasks in the descent phase of flight. 35
Figure 42. PNF/FO acknowledges the clearance from ATC. 36
Figure 43. PNF/FO confirming altitude and setting speed. 36
Figure 44. PNF/FO Speed confirmation task. 37

Figure 45. PNF/FO wait to hear flaps 1 command. 37
Figure 46. PNF/FO flaps 1 confirmation sequence. 38
Figure 47. PNF/FO Flaps 5 command and action sequence. 38
Figure 48. PNF/FO Flaps 15 command and action sequence. 39
Figure 49. PNF/FO confirmation of Flaps 15. 39
Figure 50. PNF/FO aircraft coupling action sequence. 40
Figure 51. PNF/FO aircraft coupling action sequence. 40
Figure 52. PNF/FO wait for automation engage portion of the aircraft coupling action sequence. 41
Figure 53. PNF/FO set flaps action sequence. 41
Figure 54. PNF/FO confirm flaps 20 action sequence 42
Figure 55. PNF/FO gear down action sequence. 43
Figure 56. PNF/FO landing checklist and concurrent gear down confirmation sequence. 44
Figure 57. PNF/FO aircraft speed setting sequence. 44
Figure 58. PNF/FO aircraft LNAV/VNAV mode confirmation action sequence. 45
Figure 59. PNF/FO flaps 25 action sequence. 45
Figure 60. PNF/FO flaps 25 cross check and flaps 30 setting action sequence. 46
Figure 61. PNF/FO flaps 30 action sequence. 46
Figure 62. PNF/FO 1000 ft agl and flaps 30 action sequence. 47
Figure 63. PNF/FO checklist complete and radio set for Tower action sequence 48
Figure 64. Clearance from Tower to PNF/FO. 48
Figure 65. PNF/FO tasks under 800 ft of altitude in either RNAV or CSPOs. 49
Figure 66. PNF/FO Call out runway in sight task. 49
Figure 67. PNF/FO Decision Height call out PF/CA tasks under 800 ft of altitude in either RNAV or CSPOs. 50
Figure 68. Routing task to the land phase of flight. 50
Figure 69. Routing of land tasks to either the PF/CA or the PNF/FO being further divided into wind/no wind condition and auto/manual land condition. 52
Figure 70. Setting the context for the land phase of flight. 53
Figure 71. RNAV and CSPO 800 land phase of flight tasks under 800’. 53
Figure 72. RNAV and CSPO 800 land phase of flight tasks under 650’. 54
Figure 73. RNAV and CSPO 800 land phase of flight tasks under 650’. 55
Figure 74. RNAV and CSPO 800 land phase of flight tasks under 650’. 55
Figure 75. RNAV and CSPO 800 land phase of flight tasks under 100’. 55
Figure 76. Context setting for the CSPO 200 condition. 56
Figure 77. First set of actions required of the PF/CA at 500 ft. 56
Figure 78. PF/CA runway alignment tasks under 200 ft. 56
Figure 79. PF/CA tasks under 100 ft. 57
Figure 80. PF/CA Tasks under 50 ft. 57
Figure 81. PF/CA auditory monitor of the automated call outs to TD. 57
Figure 82. Settings to stop the simulation at touchdown. 58
Figure 83. PNF/FO Context setting for the CSPO 200 condition. 58
Figure 84. First set of action required of the PNF/FO at 500 ft. 59
Figure 85. PNF/FO Runway alignment tasks under 200 ft. 59
Figure 86. PNF/FO tasks under 100 ft. 59
Figure 87. Task network settings of all of the pieces of equipment in the scenario modeled. 61
Figure 88. RNAV/CSPO routing tasks of the pieces of equipment in the scenario. 62
Figure 89. RNAV/CSPO equipment (Nav, Window, EICAS, and PFD) CAD and Jack definitions in the scenario. 62
Figure 90. RNAV/CSPO equipment (MFD, Thrust, Tiller, Autopilot,- gear, Wake display) CAD and Jack definitions in the scenario. 63

Figure 91. RNAV/CSPO equipment (Nav and Wake display) CAD and Jack definitions in the scenario. 63
Figure 92. RNAV/CSPO equipment (Nav and Wake display) CAD and Jack definitions in the scenario. 64
Figure 93. Stopping the equipment (Nav and Wake display) CAD and Jack definition task networks. 64
Figure 94. Task network of RNP probe alert. 65
Figure 95. Initial feature definitions of the environment. 66
Figure 96. PF/CA and PNF/FO routing task for setting the context to drive the RNAV information accessibility. 69
Figure 97. PF/CA and PNF/FO routing task for setting the context to drive the CSPO information accessibility. 72
Figure 98. Initial RNAV 4D component model state definitions. 73
Figure 99. Initial wake state definitions. 74
Figure 100. Equipment component initial settings. 77
Figure 101. MicroSaint Sharp Model that sends aircraft decoupling event to MIDAS. 78
Figure 102. MIDAS PF/CA and PNF/FO response to decoupling event. 79
Figure 103. MIDAS PF/CA status checks for aircraft decoupling. 79
Figure 104. MIDAS PF/CA response to decoupling event. 80
Figure 105. MIDAS PNF/FO status checks for aircraft decoupling. 80
Figure 106. MIDAS PNF/FO response to aircraft decoupling. 80
Figure 107. Task network of the PF/CA's path of a CSPO blunder events. 82
Figure 108. Task network of the aircraft yellow CSPO blunder events on the PF/CA's display. 83
Figure 109. PF/CA task network of the aircraft CSPO blunder events on both displays for both yellow and red alerts, with associated SEEV task network settings illustrated. 84
Figure 110. PF/CA tasks in response to red blunder alert. 85
Figure 111. PF/CA tasks in response to the yellow, red alerts. 85
Figure 112. PF/CA comprehension tests for the recommended response to the yellow and red blunder alerts. 86
Figure 113. PF/CA yellow/red alert tasks and wait-for conditions. 87
Figure 114. SEEV task set and perception tests for front left window and nav-wake display. 87
Figure 115. PF/CA confirmation that OTW and ND match. 87
Figure 116. PF/CA Wait-for clause for the missed approach. 88
Figure 117. Details of the routing of the PF/CA's CSPO tasks. 88
Figure 118. Flight deck SEEV task sets, salience value settings, and perception tests for red blunder states. 89
Figure 119. Logic of perception tests by both the PF/CA and the PNF/FO. 90
Figure 120. PF/CA response to missed approach call out. 91
Figure 121. PF/CA response to missed approach call out. 91
Figure 122. PF/CA SEEV Settings and weights associated with missed approach procedure. 92
Figure 123. PF/CA comprehension and acknowledgement of alert information. 92
Figure 124. PF/CA TOGA Button Press action sequence. 93
Figure 125. PNF/FOs path routing task for CSPO operations. 94
Figure 126. Network of tasks required by the PNF/FO in response to the wake display nominal, yellow and red alert phases. 99
Figure 127. High level snapshot of the air traffic control tasks and scan patterns. 100
Figure 128. ATC responsible approach control procedure. 100
Figure 129. ATC responsible yellow blunder event approach control procedures 101
Figure 130. ATC responsible controller dialogue with pilots. 101
Figure 131. ATC responsible determining the MAP and the pilot acknowledgment. 102

Figure 132. ATC responsible red blunder event tasks. 102
Figure 133. Wake vortex pilot attention response in the ATC responsible scenario. 103
Figure 134. Pilot response in the ATC responsible to the blunder event. 104
Figure 135. Pilot spatial compare requirement once alerted of blunder. 105
Figure 136. Environment model used to trigger the MIDAS operator model. 106
Figure 137. Bandwidth generator tasks used to drive information to the MIDAS operator model. 107
Figure 138. Settings in the initialization to use the bandwidth. 108
Figure 139. Variables that needed to be created to use the bandwidth generators. 108
Figure 140. ATC responsible yellow/red alert tasks for the controller. 109
Figure 141. ATC Detect release condition. 110
Figure 142. Routing task used to assign task colors to enable task tracking and to define suspend criteria. 111
Figure 143. Assigning aqua color to tasks to enable task tracking. 112
Figure 144. Criteria to stop all aqua and yellow entities. 112
Figure 145. Definition required to suspend all non-blunder related entities when a red blunder event occurs. 113
Figure 146. Halt all procedures other than the red blunder procedures. 114
Figure 147. Definition to stop the data collection when the CA sees a red blunder event. 114
Figure 148. PNF/FO red blunder event detection tasks. 115

Executive Summary

A methodical and comprehensive process was undertaken to develop and validate models of current-day Radio Navigation (RNAV) and NextGen Closely-Spaced Parallel Operations (CSPOs). The models were extended to examine "what-if" off-nominal scenarios. The off-nominal scenarios were then extended to examine candidate roles and responsibilities that could be expected to occur in full implementation of the NextGen. The findings yielded seven primary guidelines and implications for candidate NextGen roles and responsibilities and flight deck displays and automation. The present document contains the model's scenarios, tasks, and computational logic represented in MIDAS v5.

The MIDAS Closely Spaced Parallel Operations (CSPO) Network

A MIDAS v5 high-fidelity model of a two-pilot commercial crew flying current-day area navigation (RNAV) approach and landing operations was developed using a methodical, multi-dimensional approach (Gore et al., 2011). The model represented a Boeing 777 flying from 10,000 ft to touchdown at Dallas Fort-Worth (DFW) airport. The modeled scenario began with the aircraft at an altitude of 10,000 ft and 30 nm from the runway threshold. The RNAV scenario was modified to reflect the CSPO concept based on assumptions about changes to: 1) flight deck equipage (e.g., the addition of data communications, augmented wake and traffic information on the Primary Flight Display (PFD) and Navigation Display (Nav Display), and visual and auditory wake threat alerts; and, 2) flight crew tasks (e.g., identifying and tracking paired traffic, receiving and accepting datalink, monitoring wake displays). Two scenarios of the model were generated. The first model scenario maintained the assumptions of the current-day Simultaneous Offset Instrument Approaches (SOIAs) approach landing minima, specifically, a cloud ceiling of 800 ft and a decision height (DH) of 650 ft (see Gore, Hooey, Mahlstedt, & Foyle, 2013). The assumptions were made based on interviews with NextGen concept developers and scenario-based focus groups with pilots experienced with current-day Simultaneous Offset Instrument Approaches (SOIAs). This model scenario was generated to adhere to the incremental model-change followed by model-verify philosophy prior to generating the CSPO 200 ft scenario.

The Closely Spaced Parallel Operations (CSPO) scenario is a complex, human performance model scenario that tested alternate operator roles and responsibilities to a series of off-nominal operations on approach and landing (see Gore, Hooey, Mahlstedt, & Foyle, 2013). The model links together the procedures, equipment, crewstation, and external environment to produce predictions of operator performance in response to Next Generation system designs, like those expected in the National Airspace's NextGen concepts.

The task analysis that is contained in the present report comes from the task analysis window in the MIDAS software. These tasks link definitions and states for equipment components, environmental features as well as operational contexts. The current task analysis culminated in 3300 tasks that included over 1000 Subject Matter Expert (SME)-vetted, re-usable procedural sets for three critical phases of flight; the Descent, Approach, and Land procedural sets (see Gore et al., 2011 for a description of the development of the tasks included in the model; Gore, Hooey, Mahlstedt, & Foyle, 2013 for a description of the model, and its results; Hooey, Gore, Mahlstedt, & Foyle, 2013 for a description of the guidelines that were generated from the model's results; Gore, Hooey, & Foyle, 2012 for a description of the model's implementation and its settings). The rollout, after landing checks, taxi to gate and arrive at gate illustrated in Figure 1

were not used in the approach and divert scenarios exercised. The other networks in Figure 1 set up appropriate context settings for the flight deck.

The current report presents the model's task decomposition from the top/highest level and decomposes it to finer-grained levels. The first task that is completed by the model is to set all of the initial settings for the scenario runs included in the model (network 75 in Figure 1). This initialization process also resets the CAD graphic files contained with MIDAS, as well as the embedded operator models that comprise MIDAS. Following the initial settings, the model progresses to begin the first tasks required of the two flight deck operators, the Captain (CA) and the First Officer (FO). The task sets will initialize operator specific settings prior to loading all of the alerts, probes, and other events that occur in the scenario. As a note, the CA and FO were terms used in developing this model but the CA can also be thought of as the Pilot Flying (PF), while the FO can be considered the Pilot-Not-Flying (PNF)/or Pilot Monitoring (PM). As such, the document refers to the operators as PF/CA and PNF/FO respectively.

The task network model started in the task "Set Number of Runs and Other Settings". This task defines the paths that the task network will follow as it progresses through the simulation. This task also sets up the tags for the output to reflect the parameters of interest in the simulation. The settings included the type of approach being flown (RNAV versus closely spaced operations), high versus low wind, and a number of feature tests that were to be completed throughout the scenario. The Salience, Expectancy, Effort, Value of information (SEEV; Wickens & Hollands, 2008) was used to drive the simulated crewmember's attention. The settings for the SEEV model in this scenario are also presented. In addition to these settings, a number of required navigation performance (RNP) events were included in the scenario designed to test whether the crewmembers would be able to respond in a timely manner. The RNP events occurred at 3 different altitudes; 3000 ft, 900 ft, and 400 ft. The network illustrates the relationship between the equipment component and the base operator primitives of detection and comprehension that occurs as the simulation proceeds. A decoupling event and its tasks was also developed and exercised in the present model scenario.

The routing tasks or the logical arguments/tasks that direct the model to travel down a path given the environmental triggers were developed for this scenario. The routing tasks for the PF/CA provide triggers based on altitude checks (1800 ft, 1100 ft, 800 ft, 650 ft, 200 ft) and these contained specific environmental criteria that needed to occur in each scenario including the logic associated with the aircraft on the runway.

The task network model also includes all of the operator procedures that the crew is to perform during the descent, approach, and land phase of flight. During the final part of the descent in the RNAV approach, from 10,000' MSL, the PF was controlling the 777 using autopilot controls on the mode control panel (MCP). The scenario began with a descent from 10,000' to 4,000' while flying to ICKEL, as noted on the approach chart, to begin the offset ILS to 18R. Ownship was following XYZ 633 by 20-30 seconds, except that XYZ 633 was flying the ILS to 18L. The FO was primarily responsible for radio calls with approach control, for ensuring the CA was complying with ATC clearances, and for executing checklists.

The approach phase of flight was a complex phase of flight that required the PF/CA to fly the approach while maintaining a position about 20-30 seconds behind the lead aircraft XYZ 633 (and offset to the west). As XYZ 633 slows and configures for landing, the PF/CA commands the PNF/FO to configure their 777 by progressively lowering flaps and then the landing gear prior to the final approach fix (FAF) at NETEE. At NETEE, the PNF/FO radios DFW Tower, as directed, to obtain landing clearance. The **Approach Initial** (from 4000' AGL to 1800' AGL) portion of the approach phase of flight included all parts of the approach up until the Final Approach Fix (FAF). The crew was still in IMC conditions in both the RNAV approach and the VCSPA approaches. **Approach Transitional 1*** (from 1800' AGL to 1100' AGL) was still in IMC conditions in both the RNAV approach and the VCSPA approaches. **Approach Transitional 2*** (from 1100' to 800' AGL) was the last IMC segment for the RNAV approaches and the VCSPA-800 approach. The **Approach Final** (from 800' to 650' AGL) was where the crew performing the RNAV no Pair, RNAV with Pair and VCSPA-800 approaches began to breakout of the clouds and look for external features, e.g. lead aircraft and runway environment. Approach final ended at the point where the aircraft in all three scenarios reaches the Decision Height (DH) and must have both lead aircraft and runway in sight or else perform the missed approach procedure. As with the descent phase of flight, these tasks are laid out sequentially but due to the complexity of the task network, the PF/CA and the PNF/FO tasks are presented separately. The entire approach network of tasks is illustrated in Figure 14 through Figure 39 for the PF/CA tasks and Figure 40 through Figure 67 for the PNF/FO tasks.

The land phase required the crew to prepare to land the aircraft. The PF/CA flies the 777 to the runway, flares to bring the main landing gear to the pavement, and then flies the nose to the runway. When the main gear contacts the runway, the speed brakes automatically deploy (as set during the Final Descent Checklist). The PF/CA and the PNF/FO tasks for the CSPO 800' tasks, and the CSPO 200' task model networks associated with all of these phases of flight are presented.

The task network model outputs many pieces of information throughout a run including all of the model settings and details, the simulated operator's performance, the environmental performance, the aircraft performance/track, the displays among a host of other model parameters and settings included in the scenario. As a result, it is often difficult to determine which human behavior tasks occurred during a simulation scenario by considering the raw data files. Reverse Engineering is a process used to clearly present only the relevant pilot tasks that occurred (that were "fired"/triggered) during a specific scenario and/or model run along a timeline. To clearly present the relevant data that occurred in the model scenario, the raw data was sorted and filtered to remove all non-operator based tasks (termed model routing tasks). The reverse engineered process culminated in only the operator-based tasks, thereby allowing a clear comparison between model scenarios (for instance, the RNAV no pair {current day baseline}, RNAV with pair {current day aircraft pairing}, the Very Closely Spaced Parallel Operations {VCSPO} with 200 ft breakout and 800 ft breakout) to determine procedural and task differences. All of the reverse engineered models can be located on pages 97 through 185.

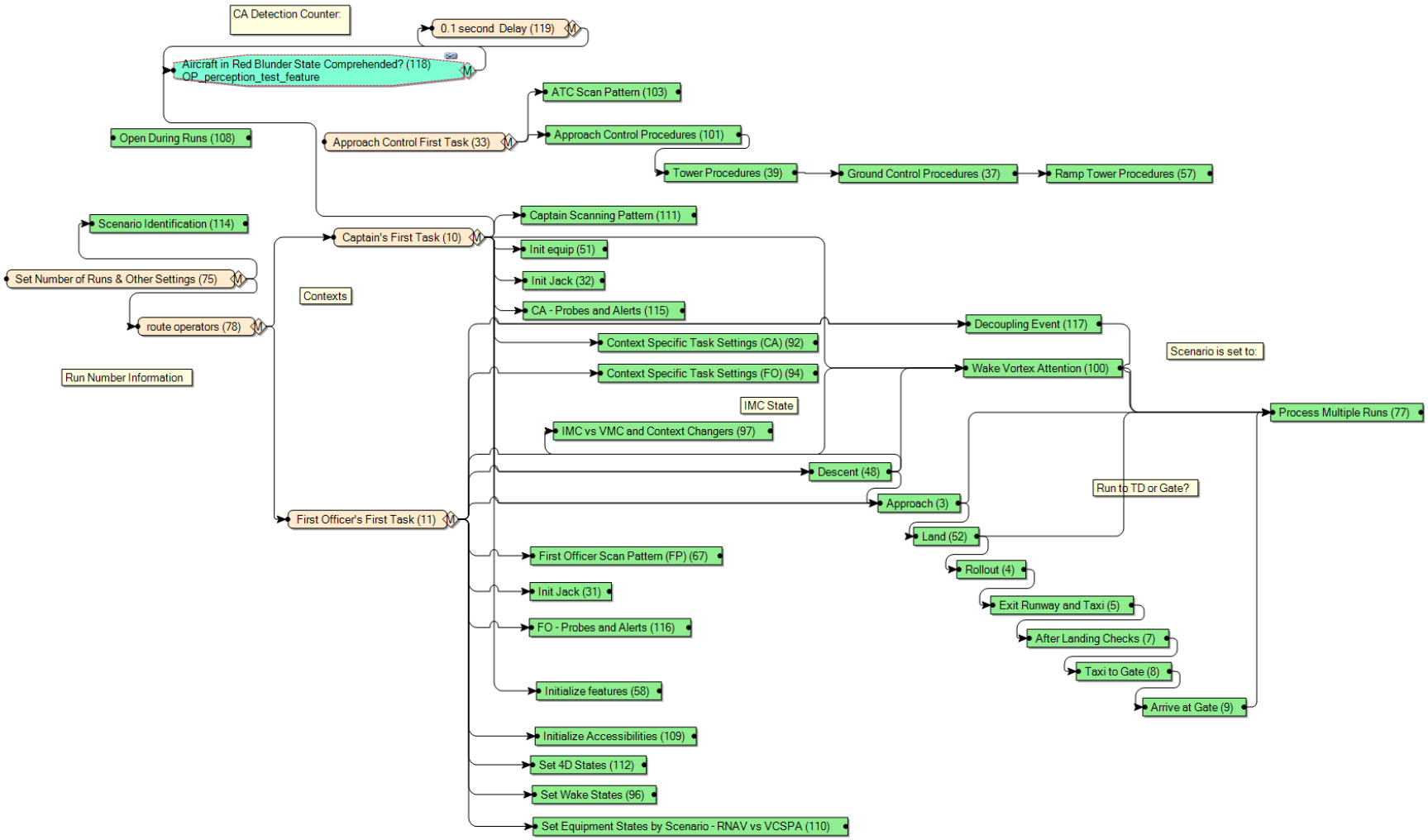


Figure 1. Top level task network for the approach and divert scenario.

Scenario Identification

The model starts in the task "Set Number of Runs and Other Settings". This task defines the paths that the task network will follow as it progresses through the simulation. This task also sets up the tags for the output to reflect the parameters of interest in the simulation. The present settings included the type of approach being flown (RNAV versus closely spaced operations), high versus low wind, and a number of feature tests that were to be completed throughout the scenario (Figure 2).

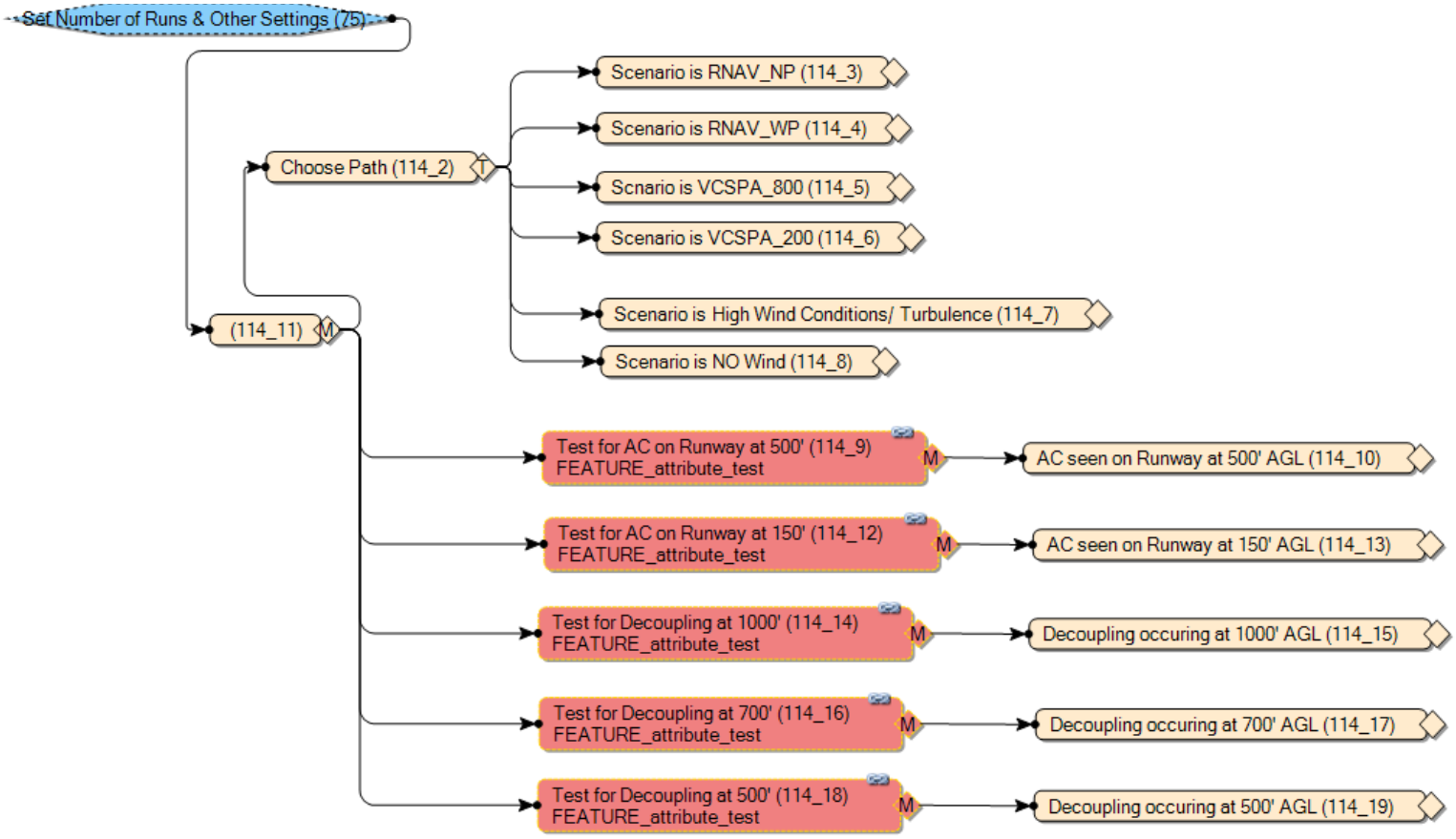


Figure 2. Set number of runs and other simulation settings.

Scan Pattern Network

A critical piece of the MIDAS software is its representation of the visual process completed to acquire information from the crewstation or from the environment. As such, two characterizations of the manner that MIDAS can take in information from the world are illustrated in Figure 3. On the left side of the figure, the SEEV settings are outlined. On the right side, a probabilistic network is outlined. The SEEV scan pattern is driven by the environment, whereas the probabilistic scan pattern is driven by predefined probabilities. The current model uses only the SEEV scan pattern.

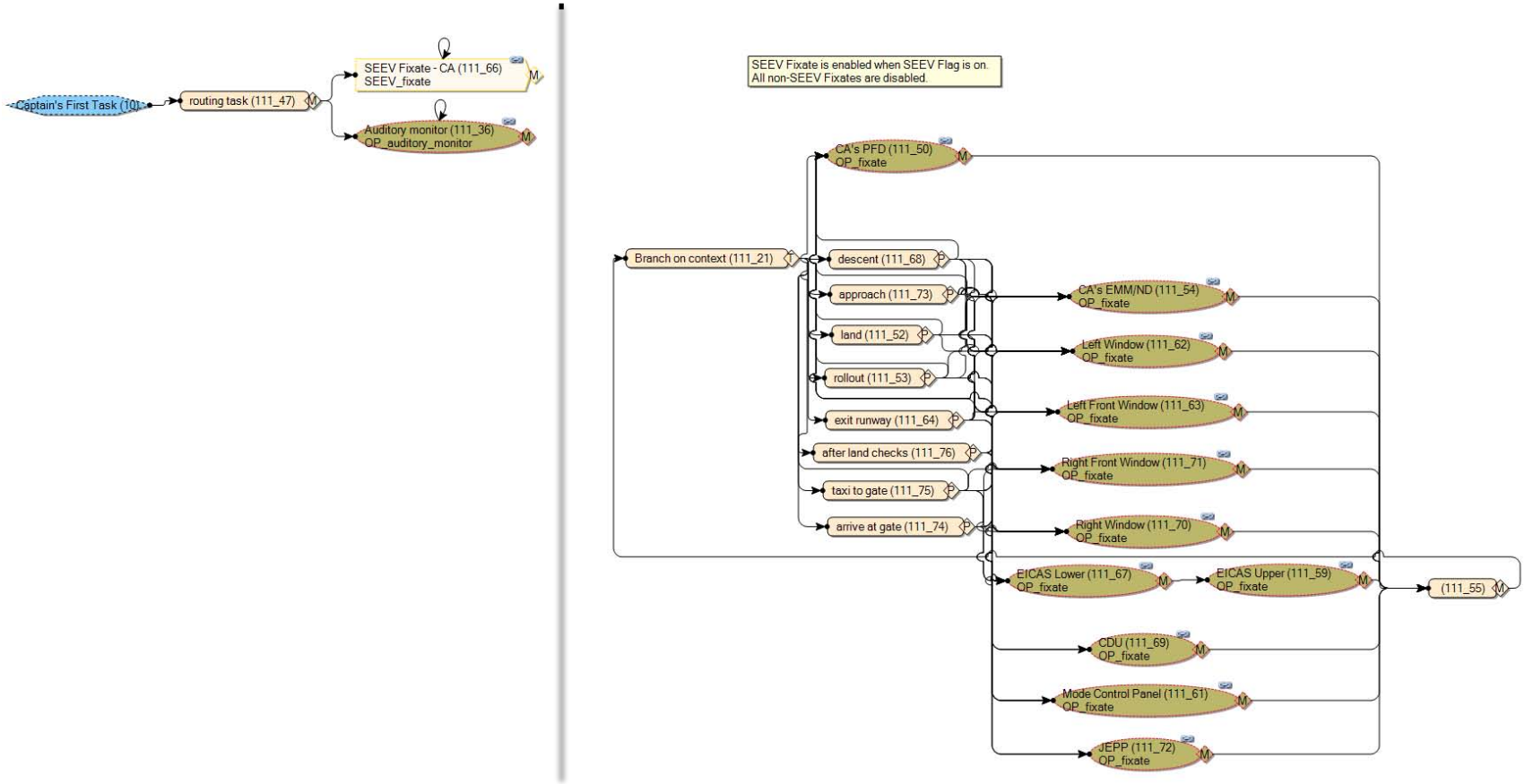


Figure 3. Scan pattern (SEEV and Probabilistic) settings for the CA/PF in the approach and land scenario.

Probes and Alerts

The probes and alerts network drove the required navigation performance (RNP) events in the scenarios (see Figure 4). The RNP events occurred at 3 different altitudes; 3000 ft, 900 ft, and 400 ft. The network illustrates the relationship between the equipment component and the base operator primitives of detection and comprehension that is satisfied as the simulation proceeds.

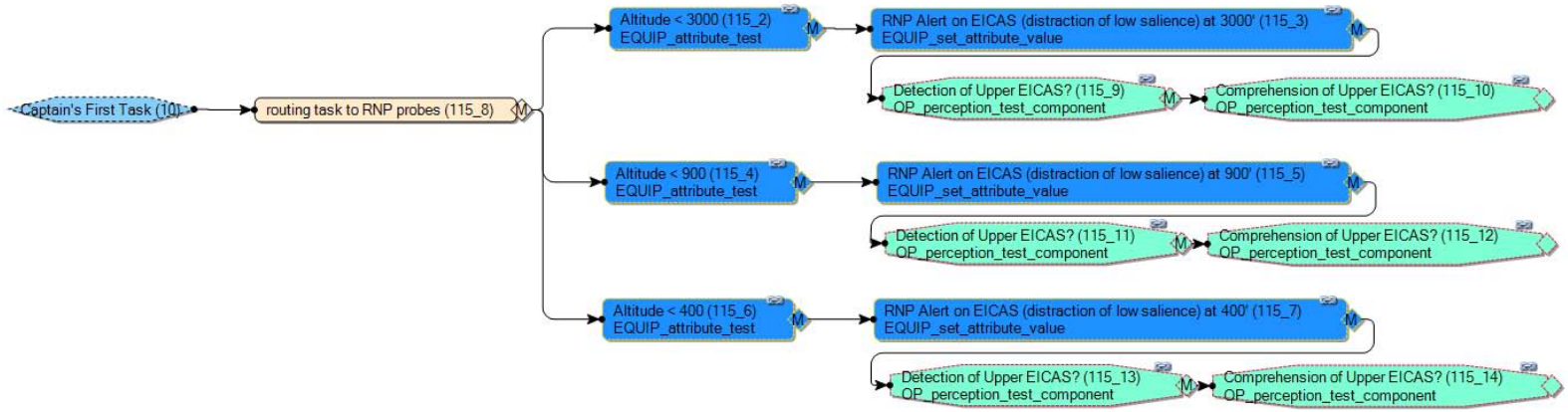
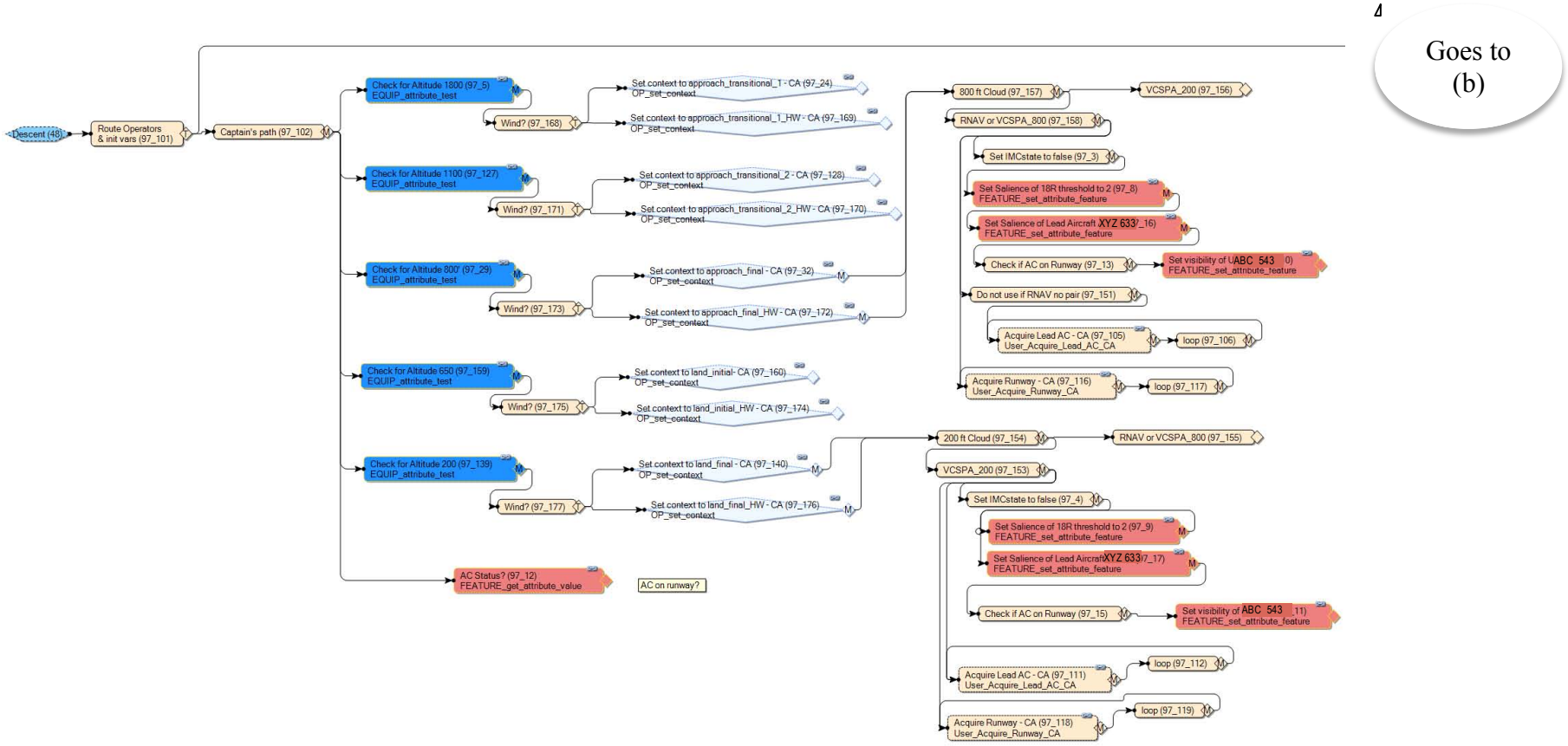


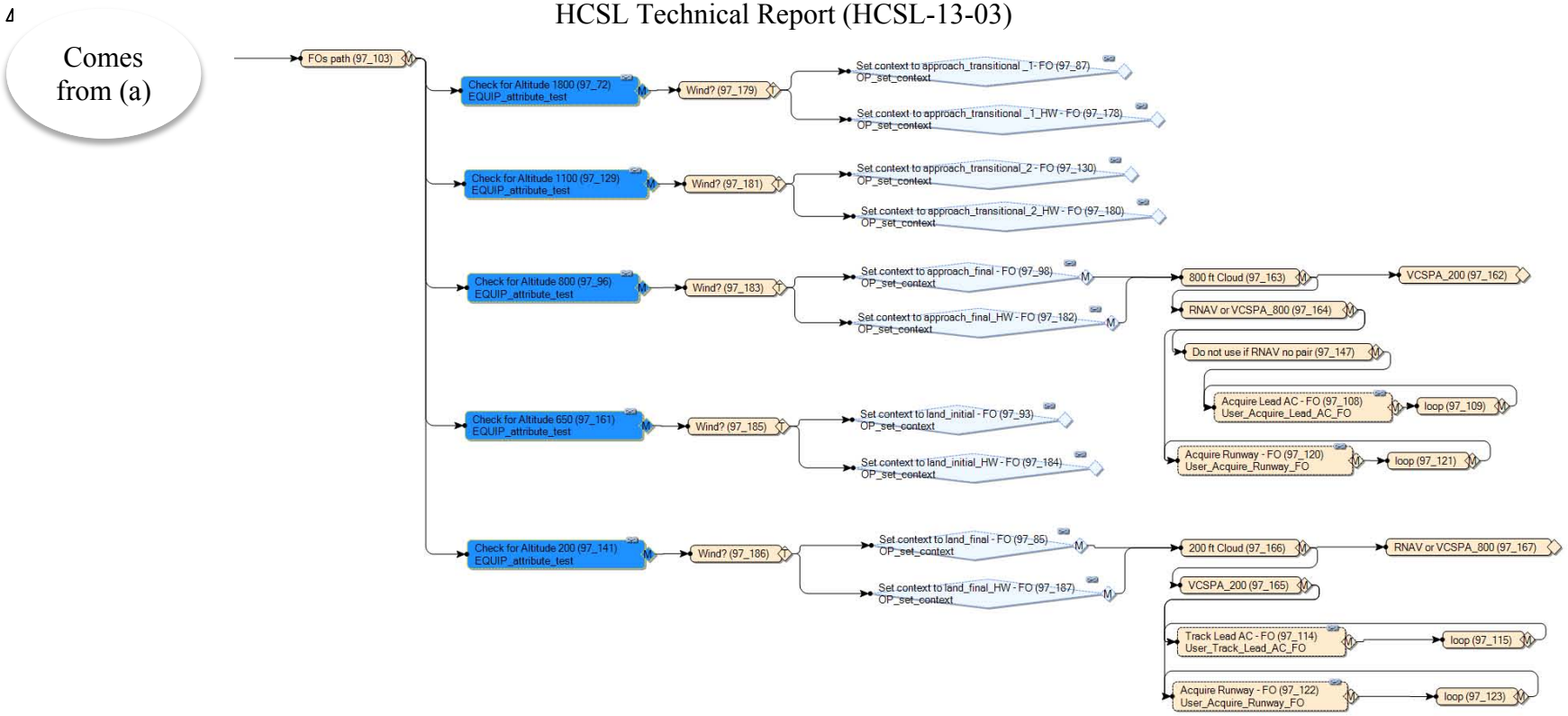
Figure 4. Probes and alerts definitions used to drive the events in the scenario.

Settings for Routing Tasks

The routing tasks are logical arguments/tasks that direct the model to travel down a path given the environmental triggers. Figure 5a and b illustrates the routing arguments for the PF/CA and for the PNF/FO. The routing tasks for the PF/CA provide triggers based on altitude checks (1800 ft, 1100 ft, 800 ft, 650 ft, 200 ft) contain specific environmental criteria that need to occur in each scenario including the logic associated with the aircraft on the runway. The right side of the figure illustrates the logic associated with the PNF/FO routing triggers at the same altitudes as the PF/CA.



(a)

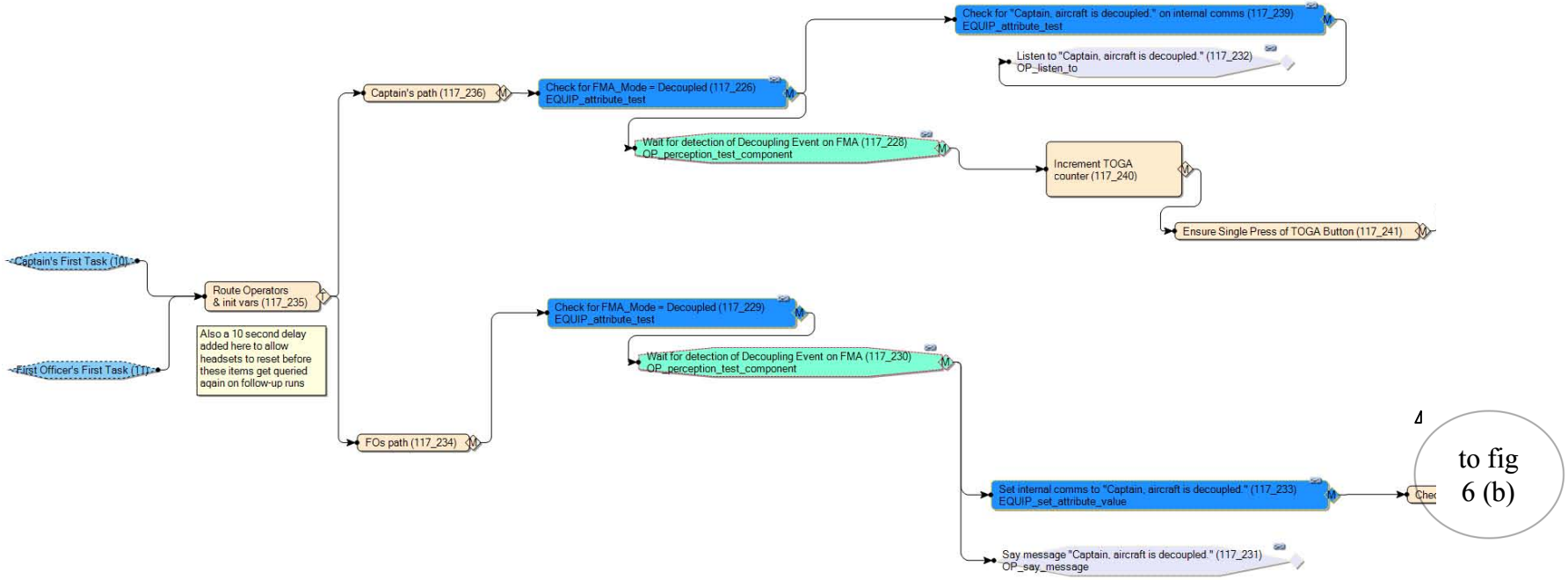


(b)

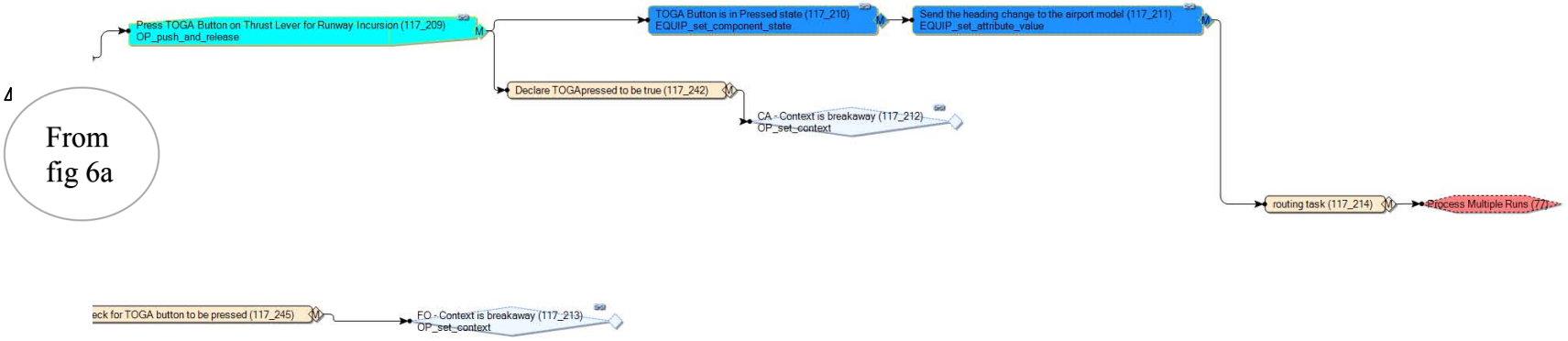
Figure 5. Settings for the routing tasks.

Decoupling Event

The task network in Figure 6 a and b illustrates the entire decoupling tasks that the PF/CA and PNF/FO are required to complete when the aircraft becomes decoupled. This network will be illustrated at a lower level in Figure 102 through Figure 106.



(a)



(b)

Figure 6. The task network of the decoupling event.

Wake Vortex Attention Network

The wake vortex attention network could not be copied because the network was too large and breaking it into component elements is meaningless. The reader is asked to contact NASA for further information about the wake vortex network.

Descent Network of Tasks

During the final part of the descent in the RNAV approach, from 10,000' MSL, the PF is primarily controlling the 777 using autopilot controls on the mode control panel (MCP). The scenario begins here with a further descent from 10,000' to 4,000' while flying to ICKEL, as noted on the approach chart, to begin the offset ILS to 18R. Ownship is following XYZ 633 by 20-30 seconds, except that XYZ 633 is flying the ILS to 18L. The FO is primarily responsible for radio calls with approach control, for ensuring the CA is complying with ATC clearances, and for executing checklists. The descent network of tasks is made up of Figure 7 through Figure 13 and is laid out sequentially with the upper half of the figure illustrating the PF/CA responsibilities and the lower half of the figure illustrating the PNF/FO responsibilities.

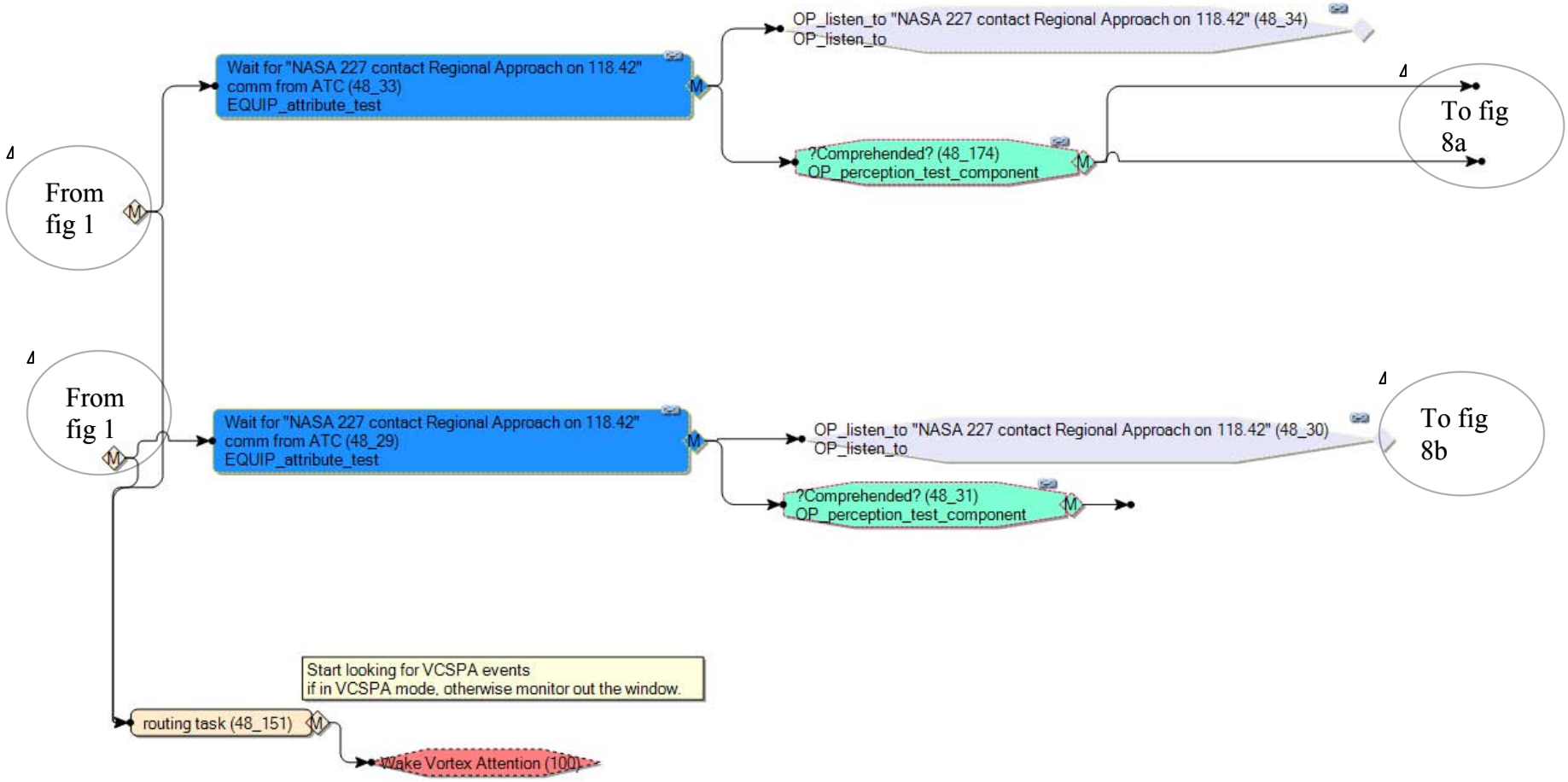


Figure 7. The descent task broke into two paths, that for the PF and for the PNF/FO (the network feeds into the multiple decision node and exit at the arrow periods which go to Figure 8a for the PF/CA and 8b for the PNF/FO in series).

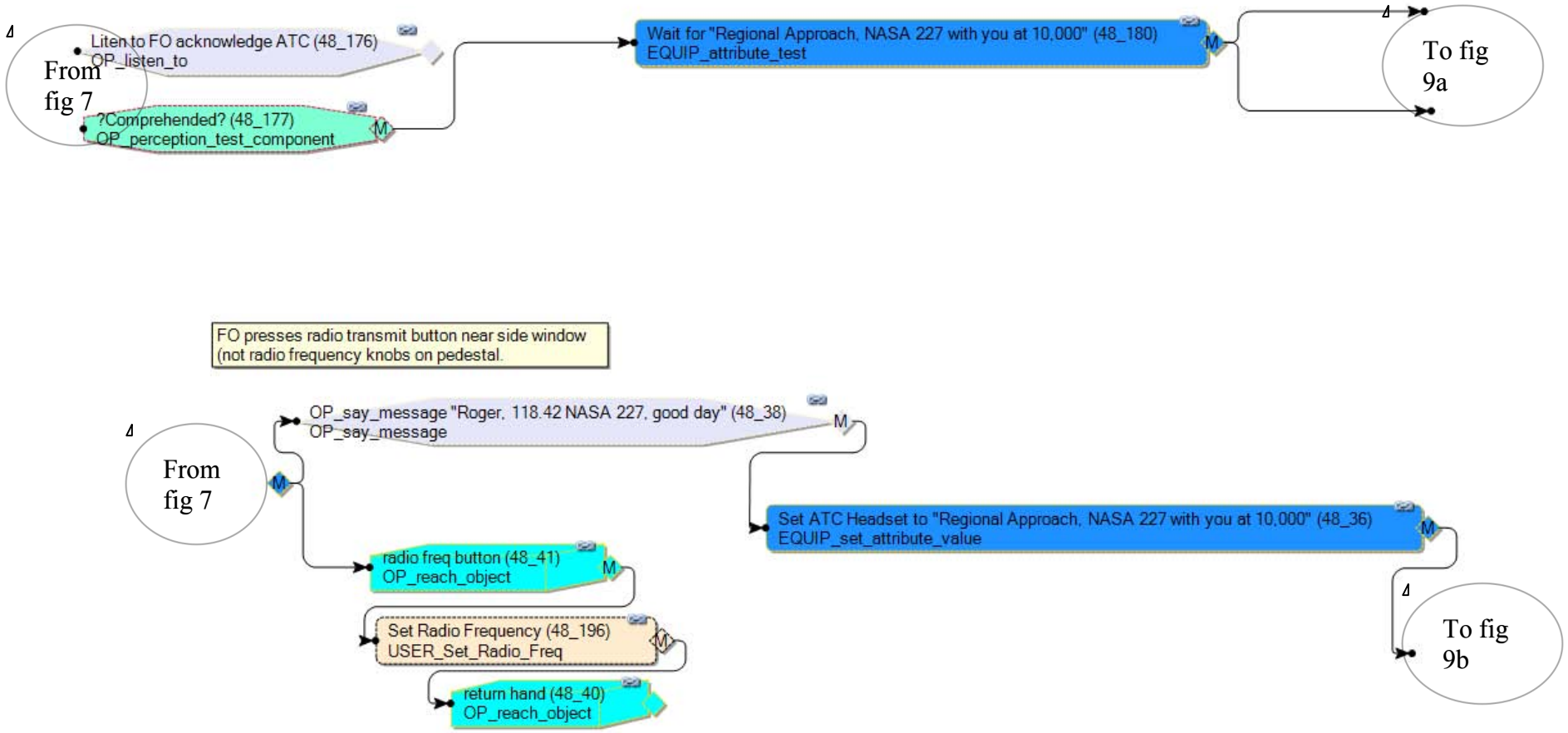


Figure 8. PF/CA and PNF/FO tasks in the descent phase of flight.

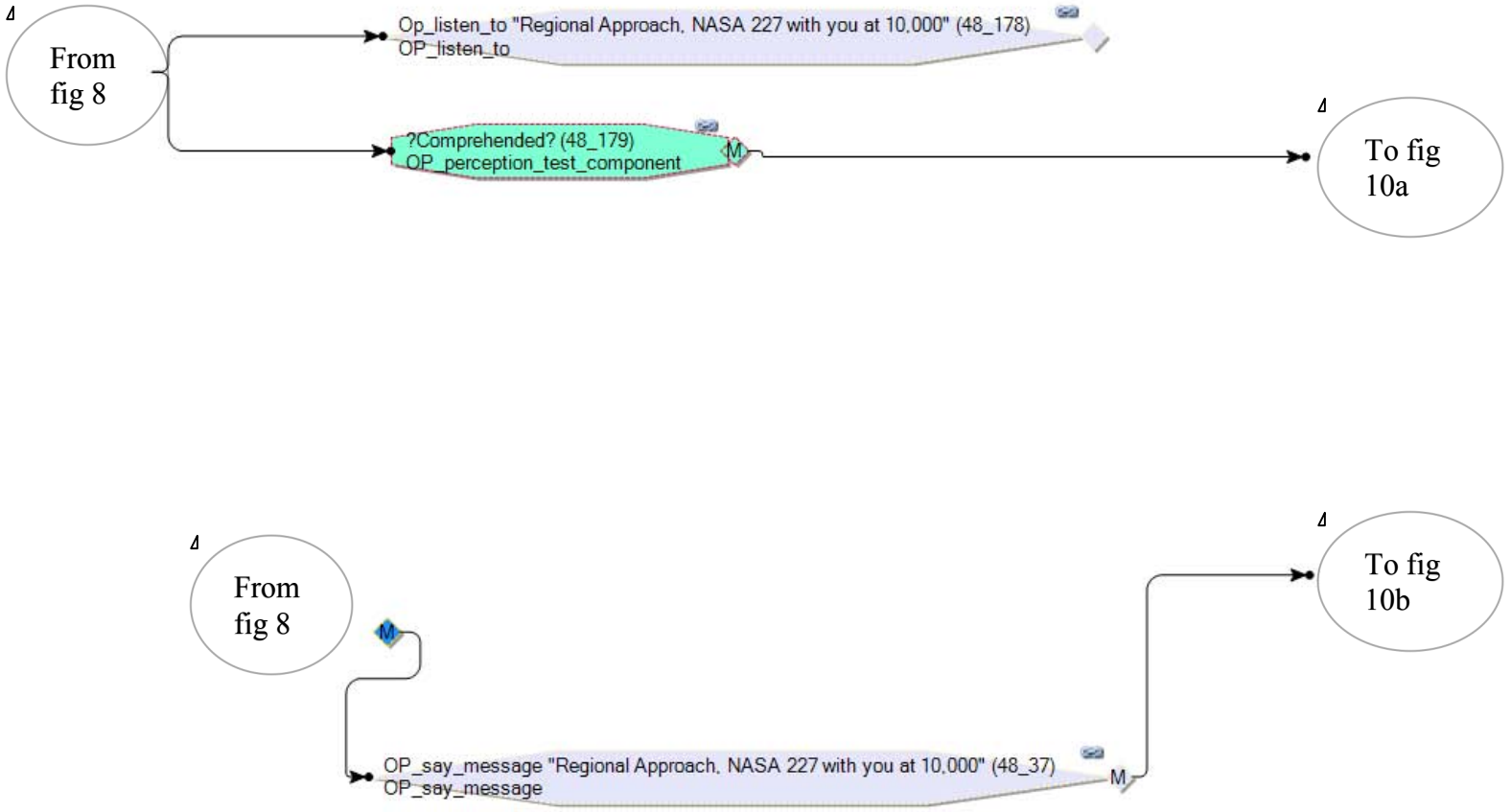


Figure 9. PF/CA and PNF/FO tasks in the descent phase of flight involving the communication at 10000' from the PNF/FO to the ATC and the PF/CA hearing the communication.

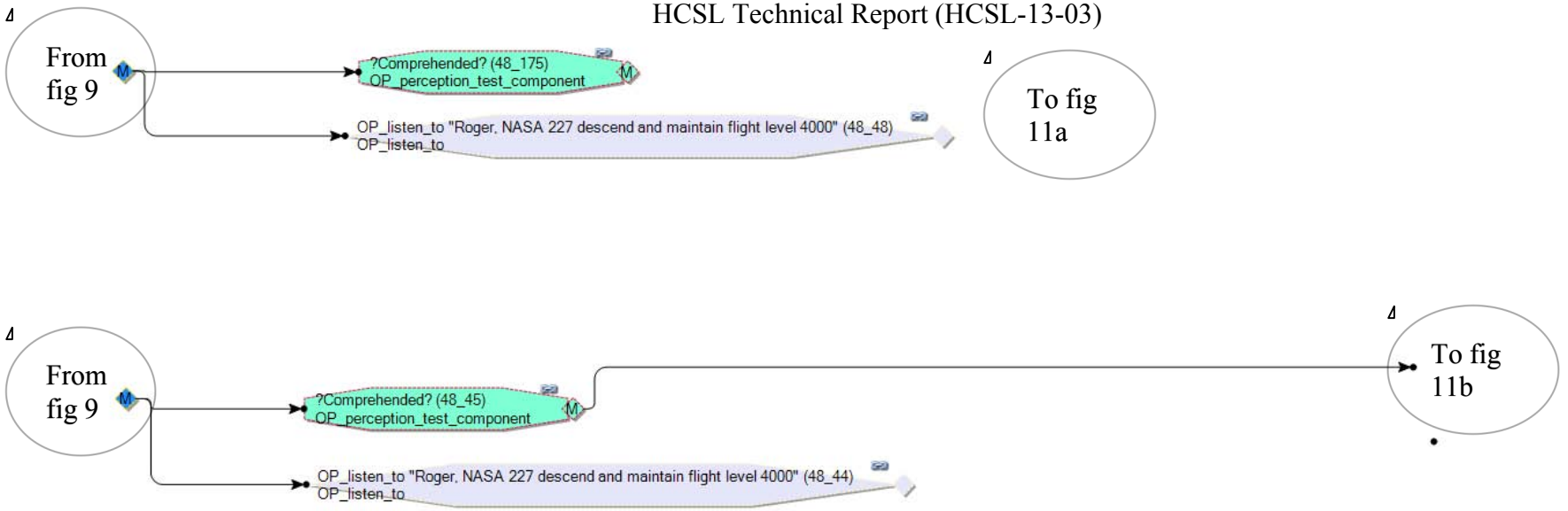


Figure 10. PF/CA and PNF/FO tasks in the descent phase of flight involving the communication at 4000' from the PNF/FO to the ATC and the PF/CA hearing the communication.

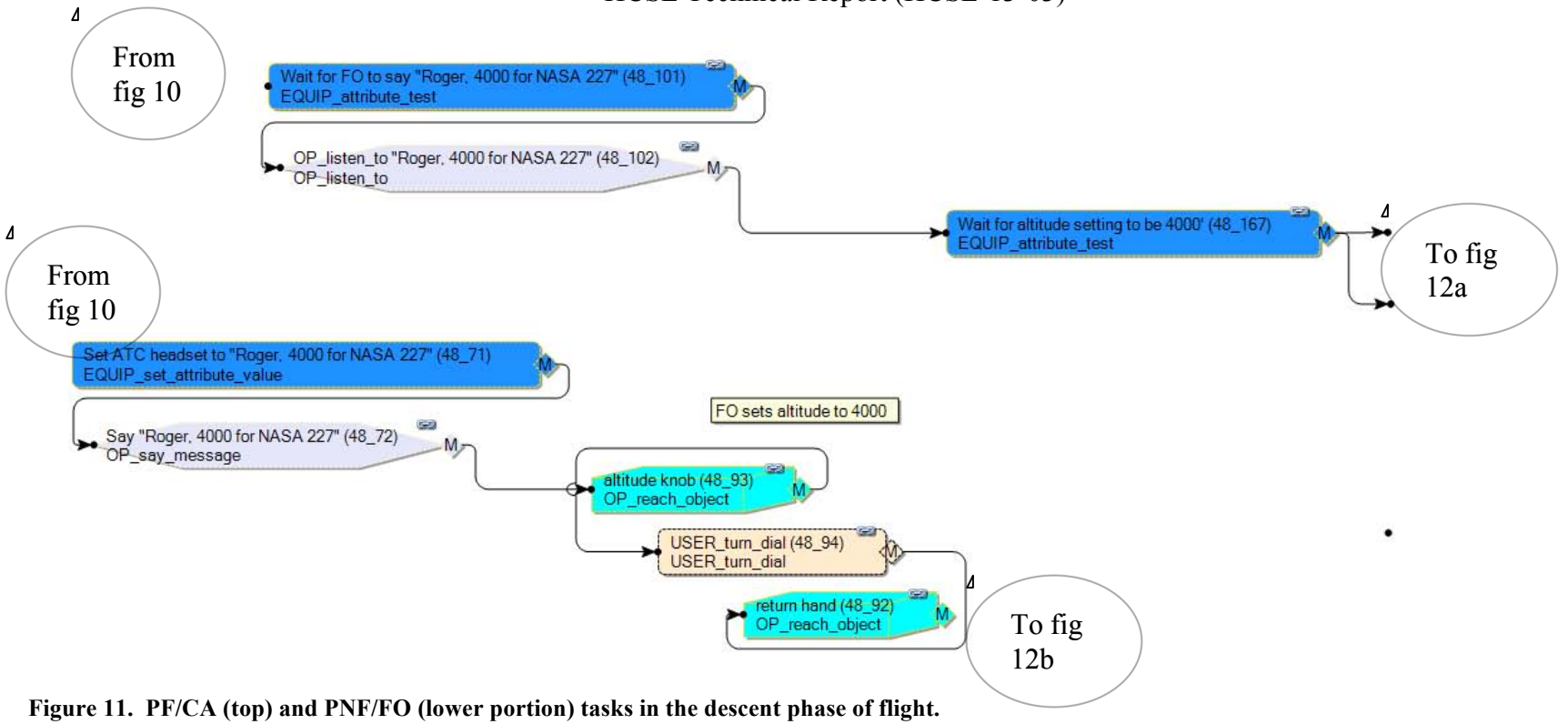


Figure 11. PF/CA (top) and PNF/FO (lower portion) tasks in the descent phase of flight.

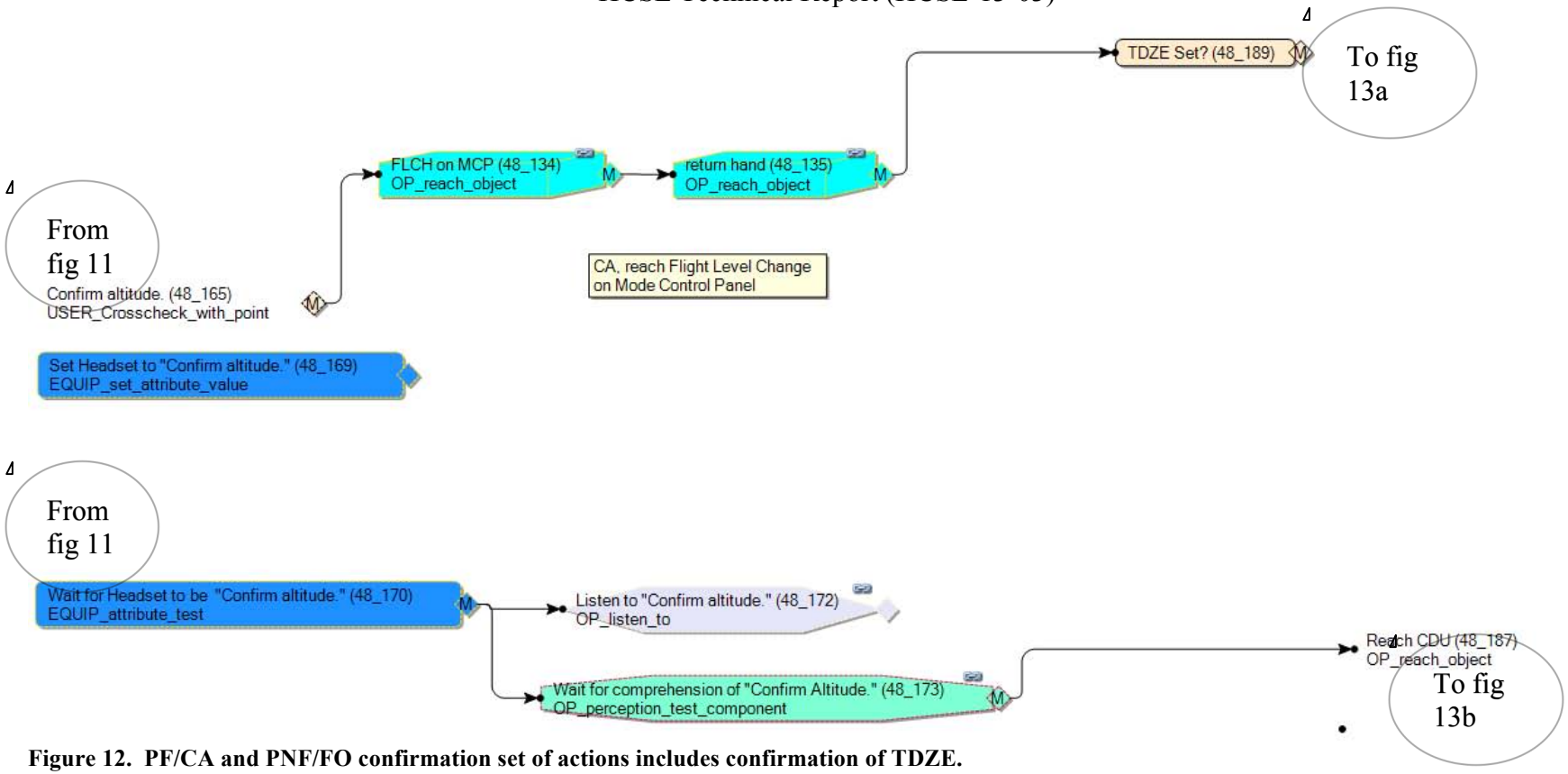


Figure 12. PF/CA and PNF/FO confirmation set of actions includes confirmation of TDZE.

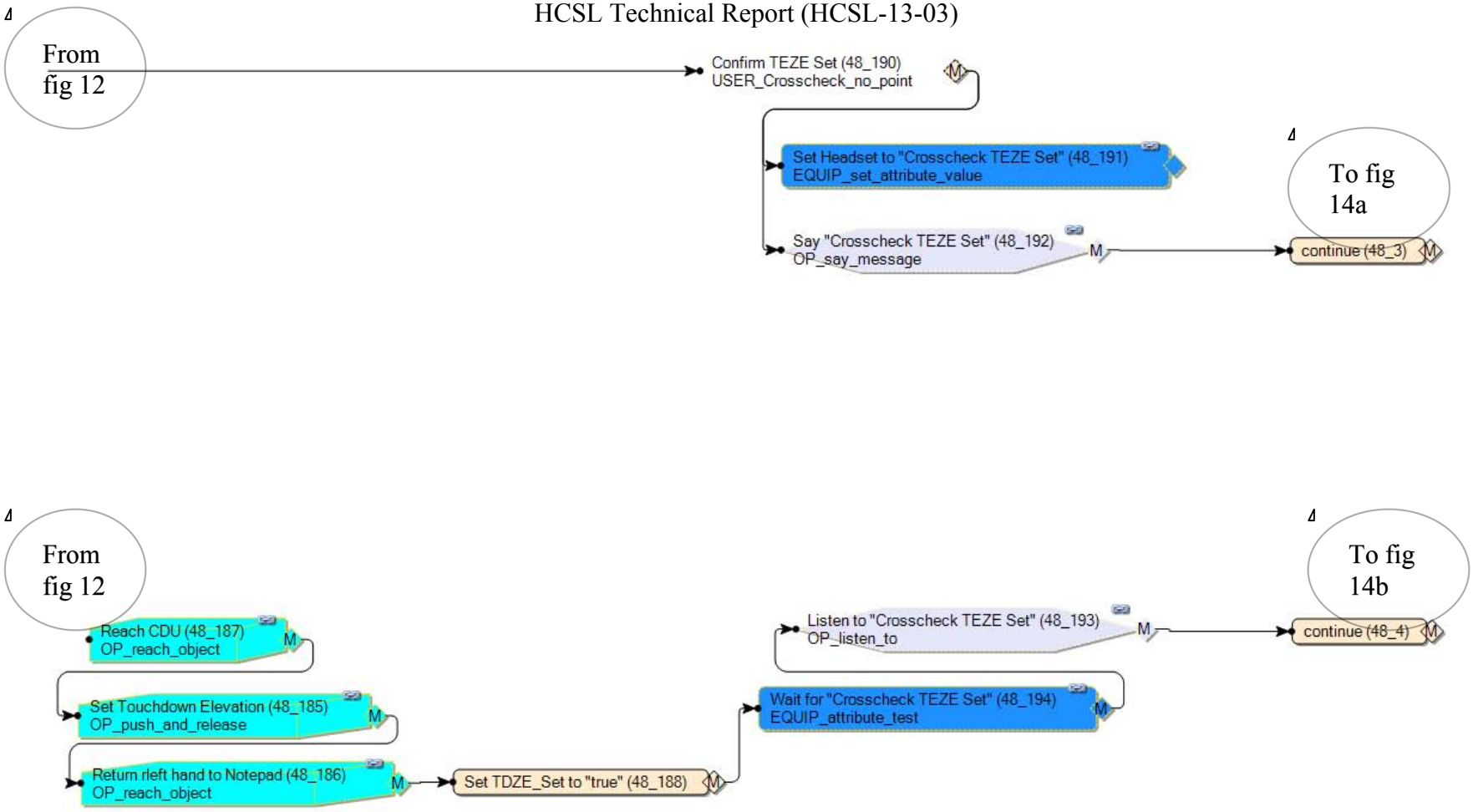


Figure 13. PF/CA (top) and PNF/FO (lower portion) final tasks in the descent phase of flight.

Approach Phase of Flight

The approach phase of flight was a complex phase of flight that required the PF/CA to fly the approach while maintaining a position about 20-30 seconds behind the lead aircraft XYZ 633 (and offset to the west). As XYZ 633 slows and configures for landing, the PF/CA commands the PNF/FO to configure their 777 by progressively lowering flaps and then the landing gear prior to the final approach fix (FAF) at NETEE. At NETEE, the PNF/FO radios DFW Tower, as directed, to obtain landing clearance.

The Approach portion of the flight is further broken down into the following three phases:
Approach Initial (from 4000' AGL to 1800' AGL). This portion includes all parts of the approach up until the Final Approach Fix (FAF). Also in this portion of the approach, the crew is still in IMC conditions in both the RNAV approach and the VCSPA approaches.
Approach Transitional 1* (from 1800' AGL to 1100' AGL). In this portion of the approach, the crew is still in IMC conditions in both the RNAV approach and the VCSPA approaches.
Approach Transitional 2* (from 1100' to 800' AGL). This is the last IMC segment for the RNAV approaches and the VCSPA-800 approach.
***Note**: the Approach Transitional 1 and Approach Transitional 2 contexts were modeled separately for the majority of this project phase but their data were combined.
Approach Final (from 800' to 650' AGL). In previous versions of the model this first portion of the approach is where the crew performing the RNAV no Pair, RNAV with Pair and VCSPA-800 approaches begins to breakout of the clouds and look for external features, e.g. lead aircraft and runway environment. Approach final ends at the point where the aircraft in all three scenarios reaches the Decision Height (DH) and must have both lead aircraft and runway in sight or else perform the missed approach procedure.

As with the descent phase of flight, these tasks are laid out sequentially but due to the complexity of the task network, the PF/CA and the PNF/FO tasks are presented separately. The entire approach network of tasks is illustrated in Figure 14 through Figure 39 for the PF/CA tasks and Figure 40 through Figure 67 for the PNF/FO tasks.

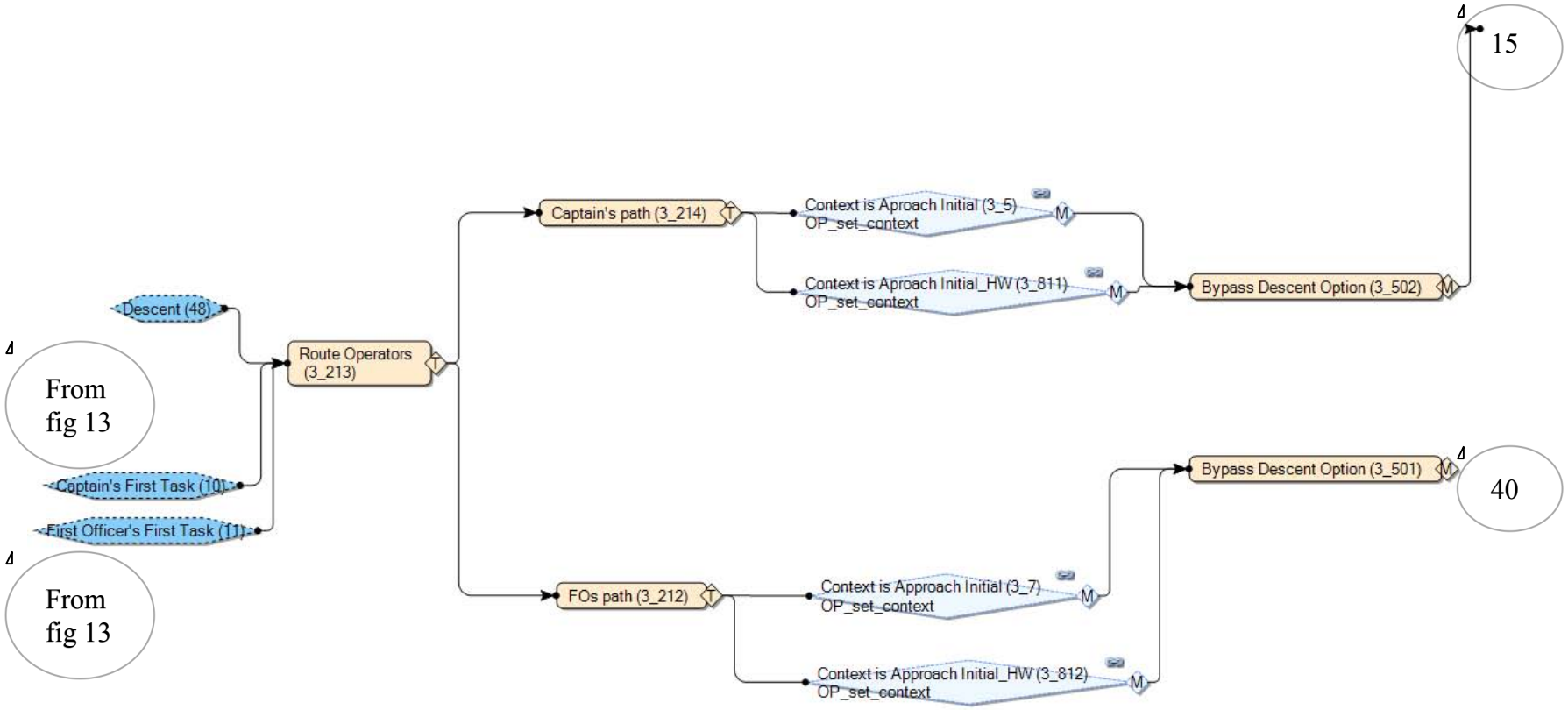


Figure 14. PF/CA (top) and PNF/FO (lower portion) bracket tasks to set the approach context phase of flight.

PF/CA Approach Task Network Model

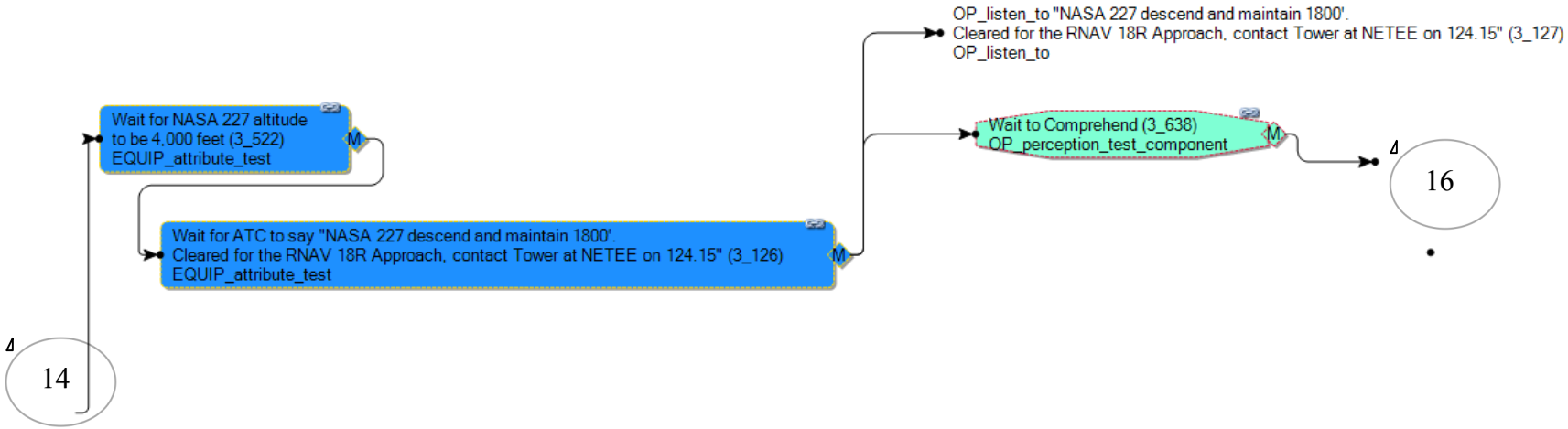


Figure 15. PF/CA tasks in the descent phase of flight.

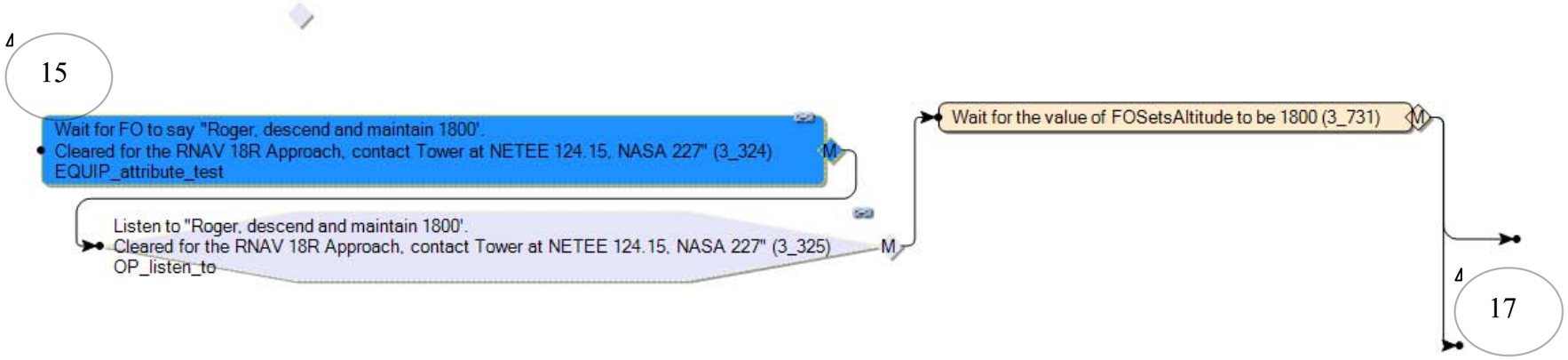


Figure 16. PF/CA 'wait-for' communication clause in the approach phase of flight.

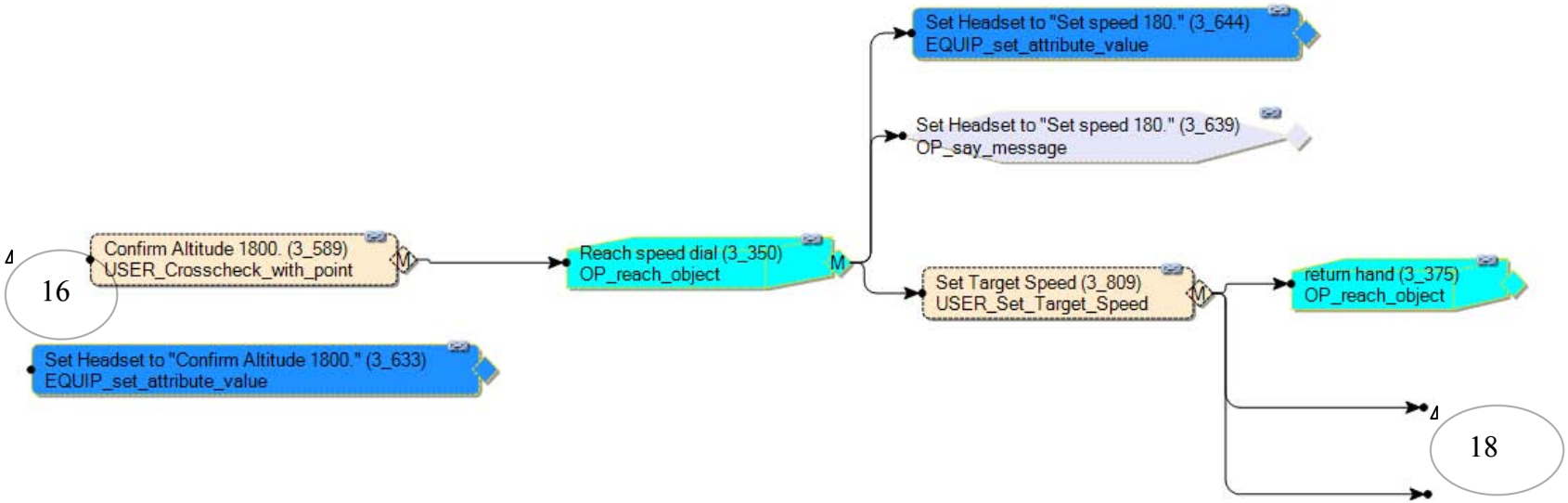


Figure 17. PF/CA confirmation of altitude in the approach phase of flight.

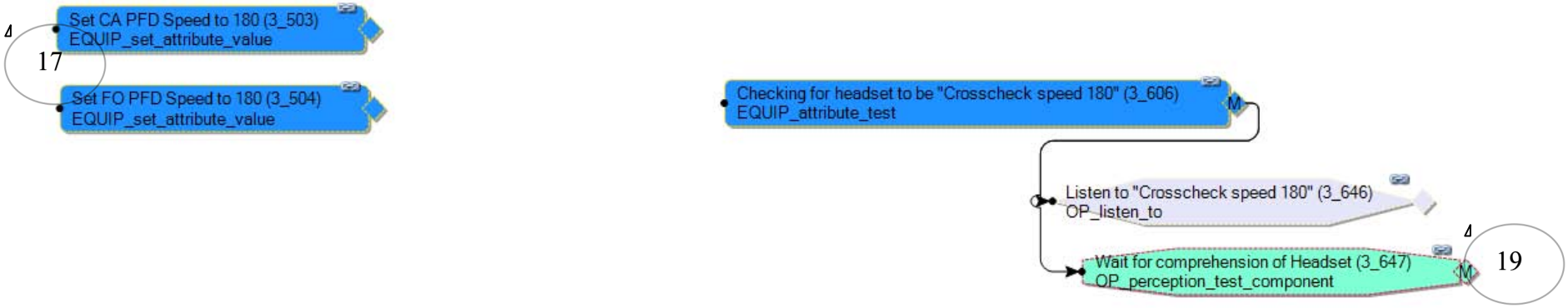


Figure 18. PF/CA speed confirmations required in the approach phase of flight.

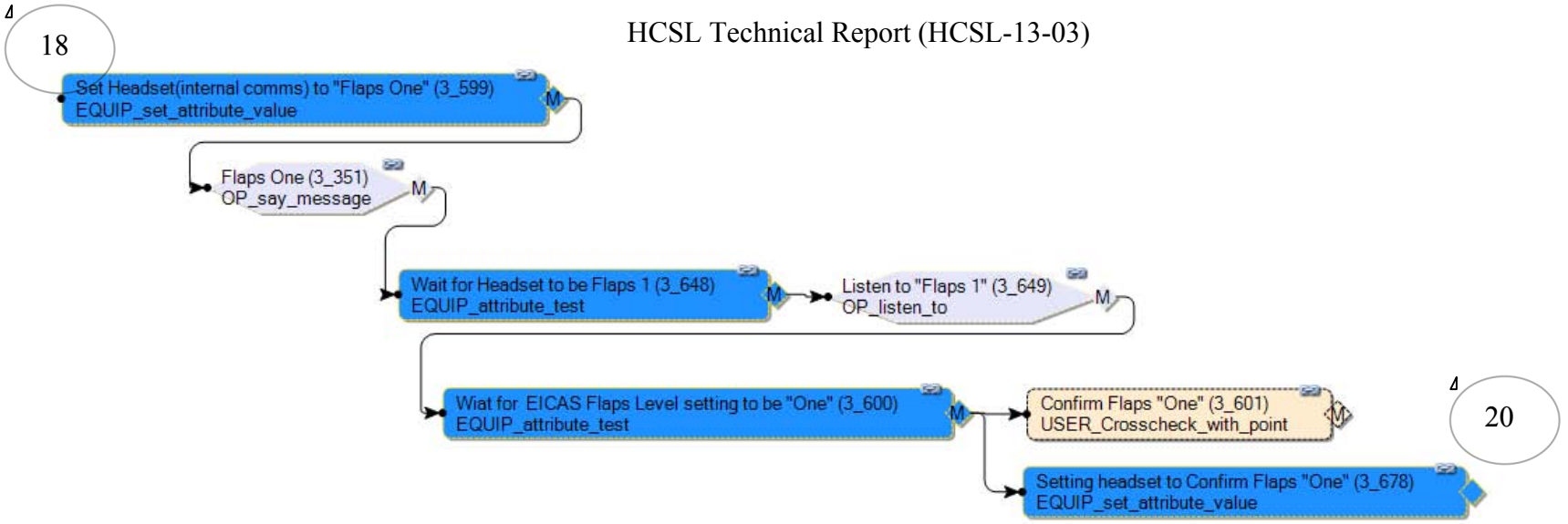


Figure 19. Equipment settings and flaps actions required in the approach phase of flight context.

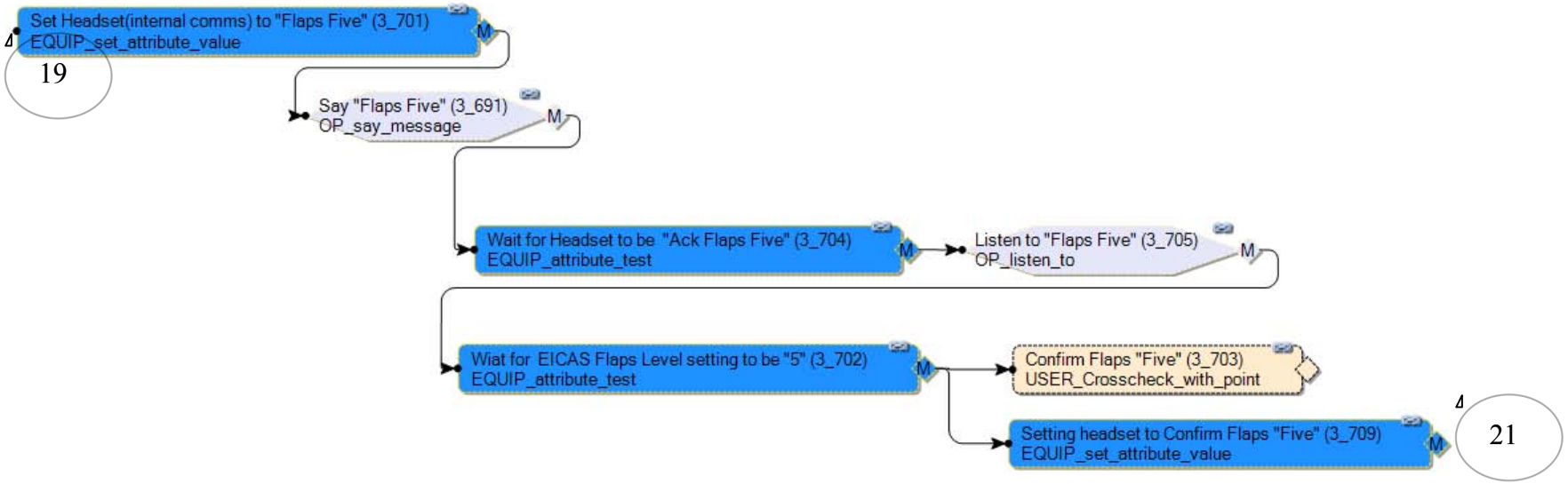


Figure 20. Equipment settings and flaps actions required in the approach phase of flight context.

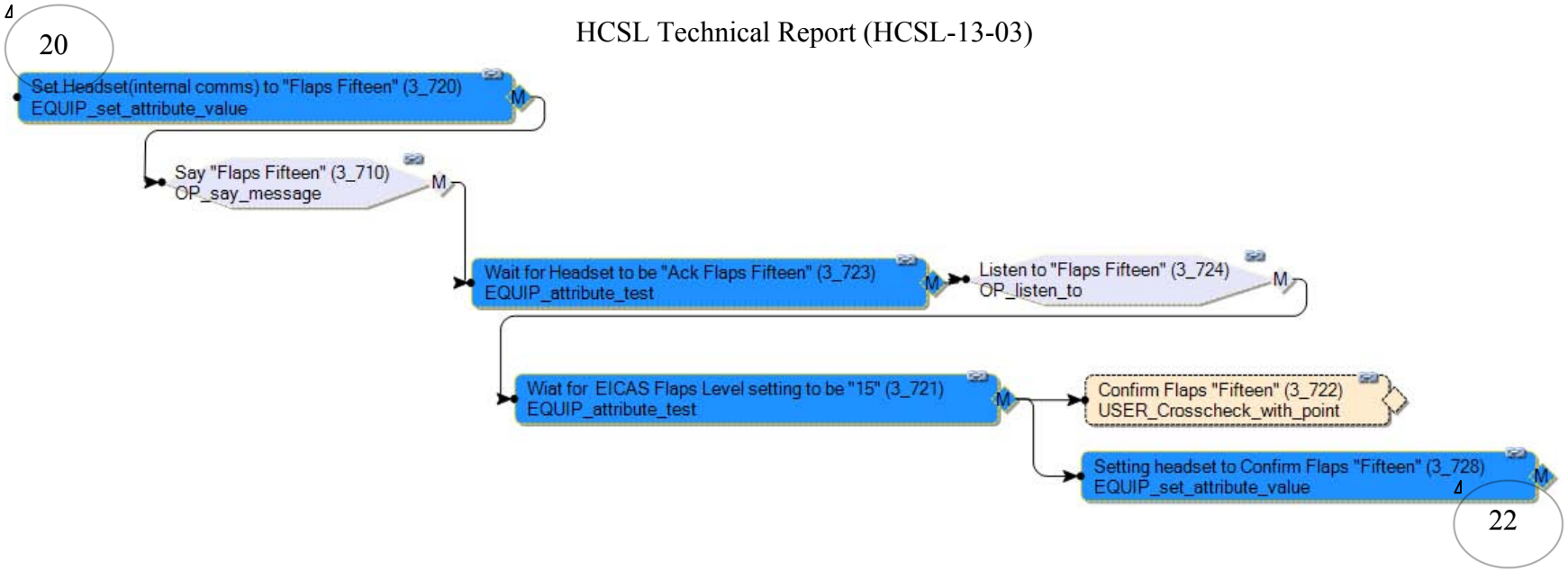


Figure 21. Equipment settings and flaps actions required in the approach phase of flight context.

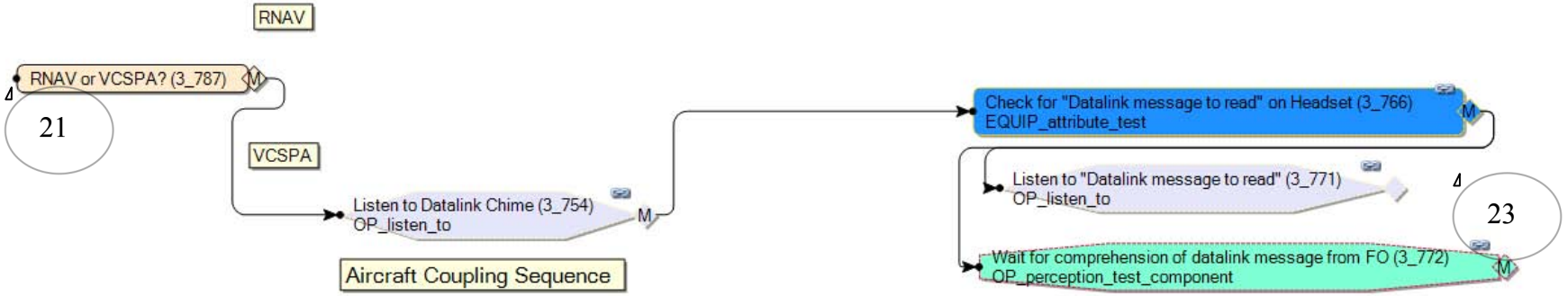


Figure 22. Aircraft coupling sequence actions required in the approach phase of flight context.

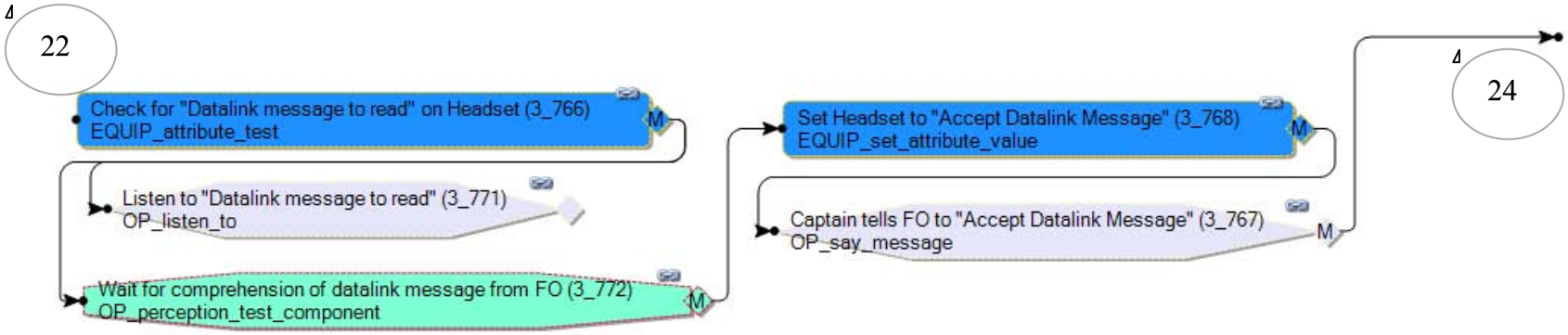


Figure 23. Aircraft coupling sequence datalink actions required in the approach phase of flight context.

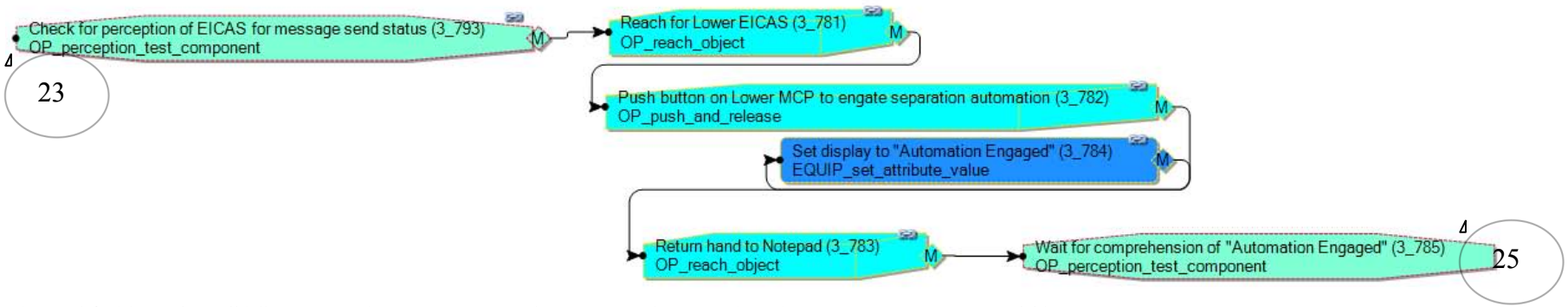


Figure 24. Aircraft EICAS check actions, and separation automation required in the approach phase of flight context.

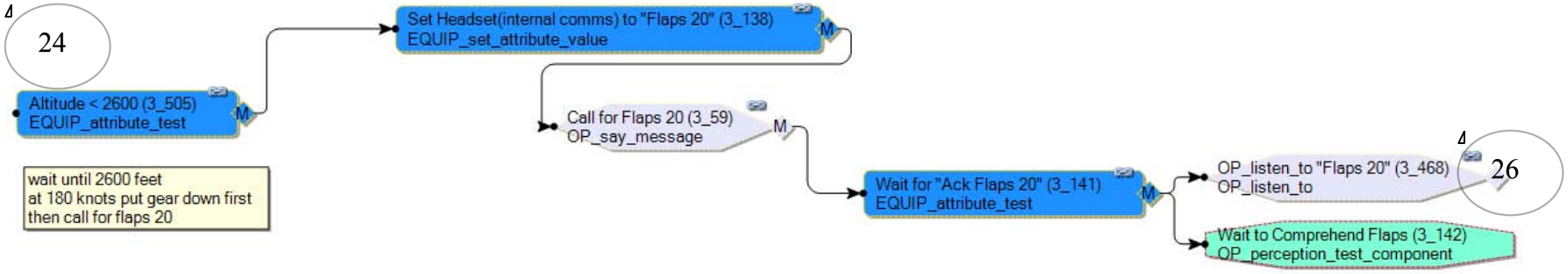


Figure 25. Flaps 20 actions.

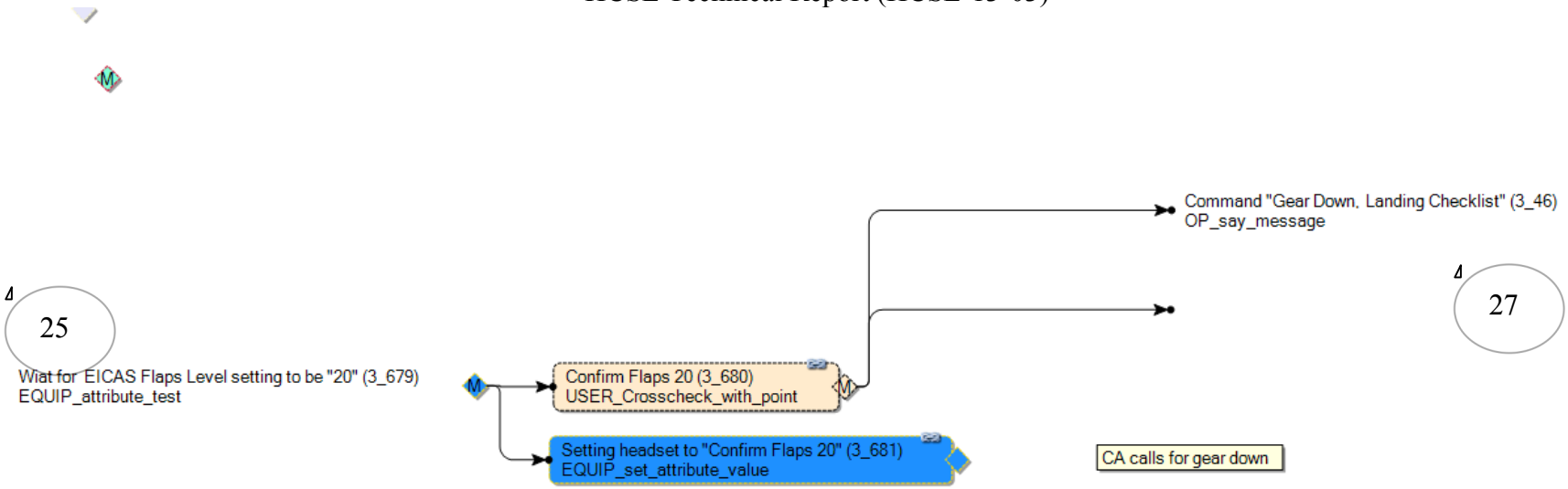


Figure 26. Confirmation of flaps 20 through attribute tests.

Figure 27. Gear down and throttle actions required by the PF/CA at flaps 20.

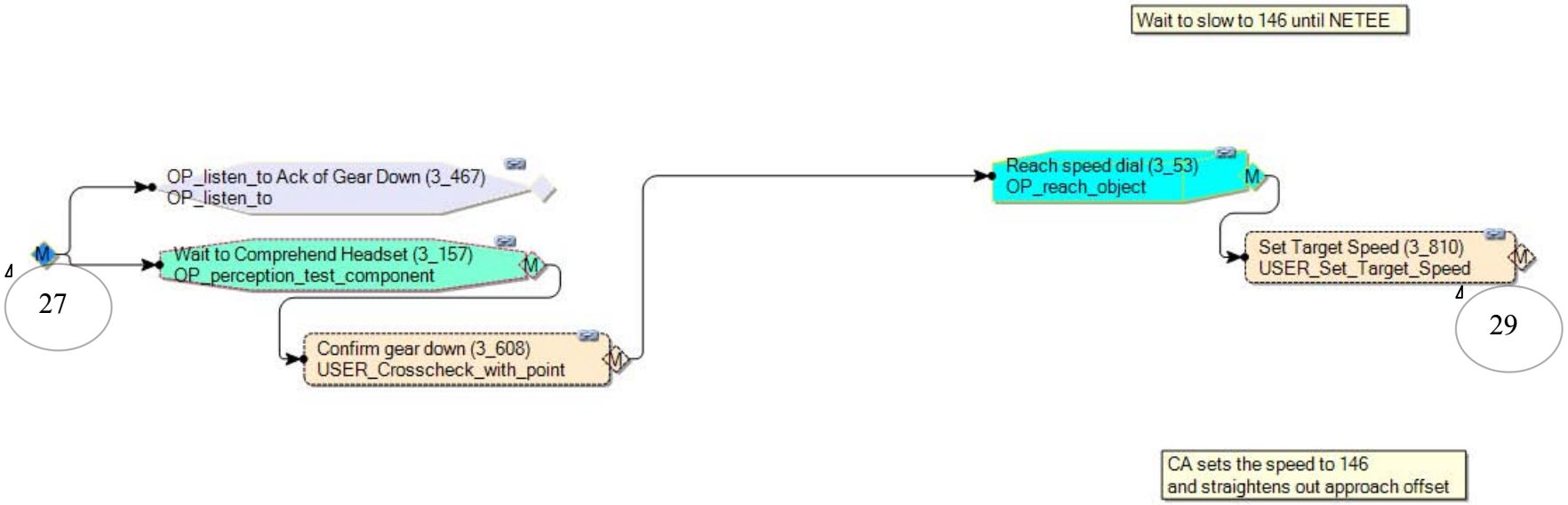


Figure 28. PF/CA Crosschecks and speed setting actions before NETEE waypoint.

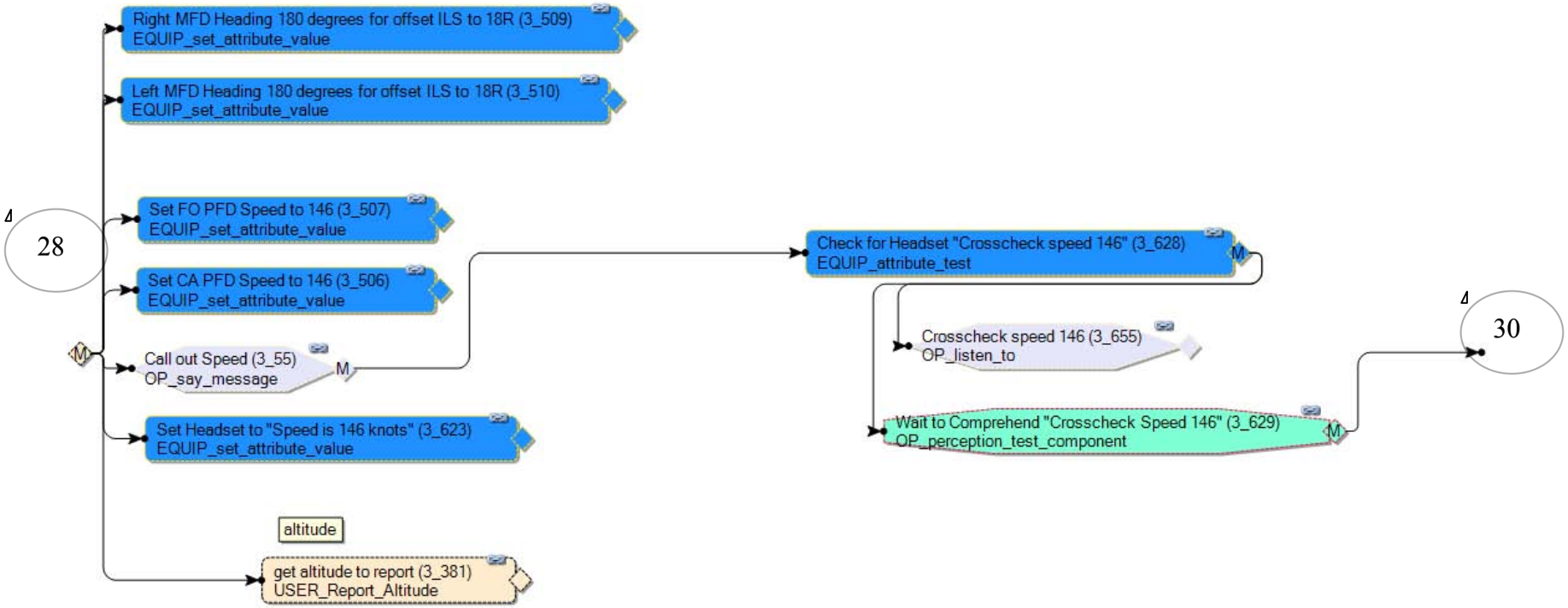


Figure 29. PF/CA Tasks when aircraft has slowed to 146 kts.

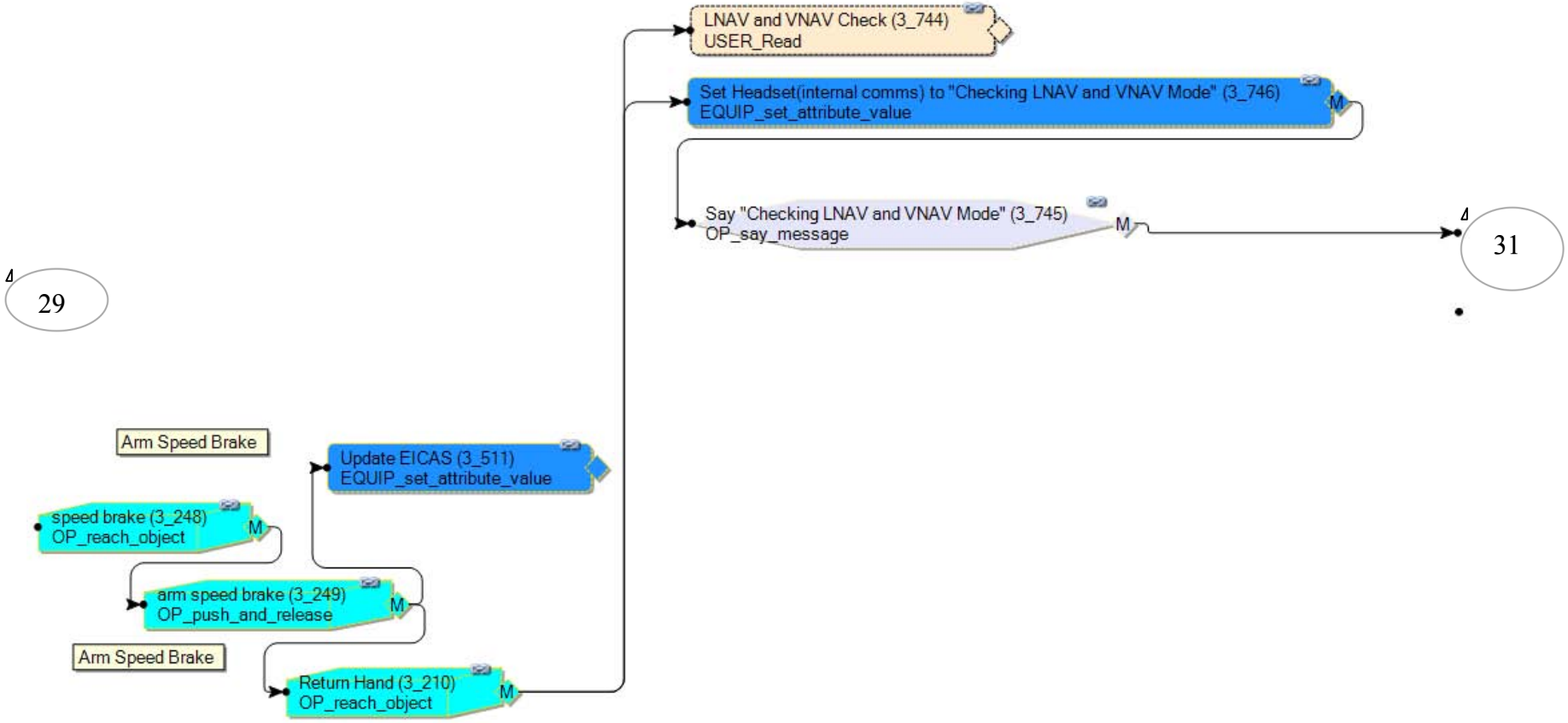


Figure 30. PF/CA Speed brakes action sequence.

30

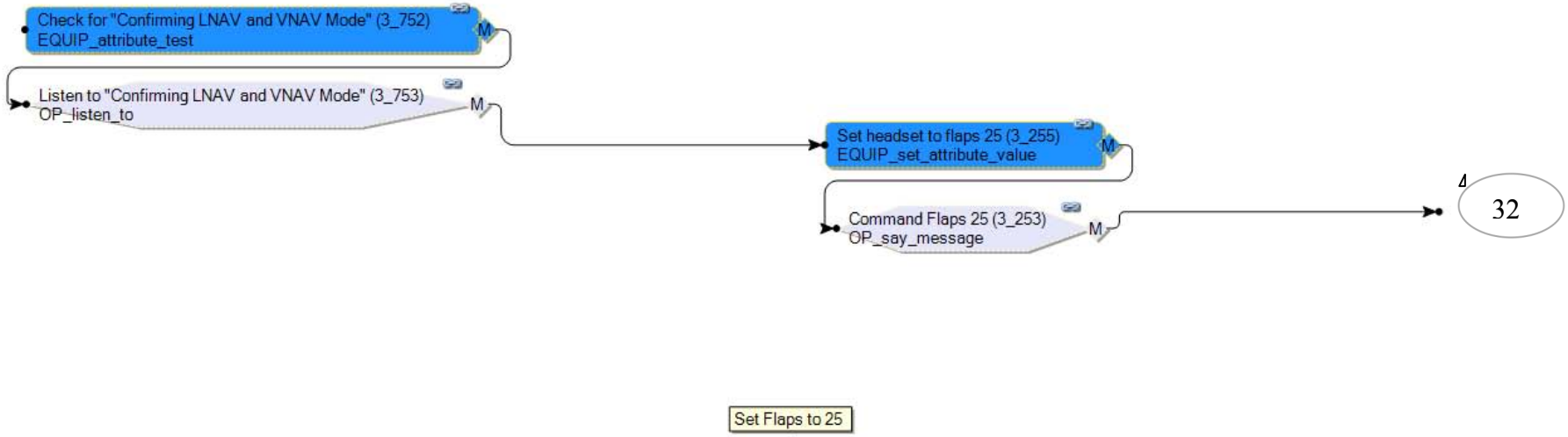


Figure 31. PF/CA confirmation of VNAV/LNAV mode.

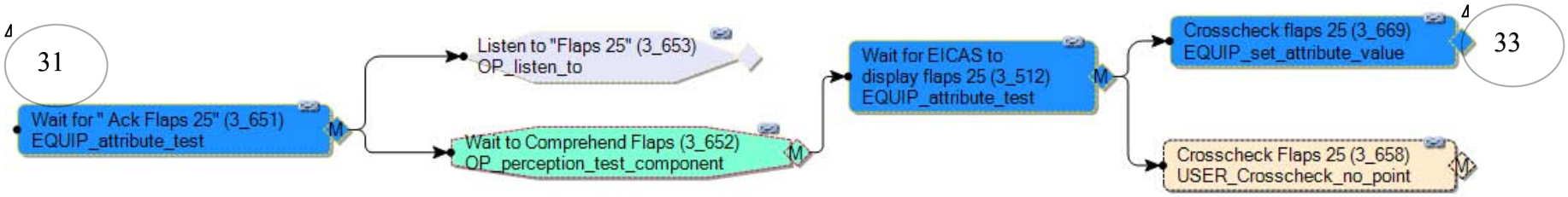


Figure 32. PF/CA flaps 25 actions and cross checks.

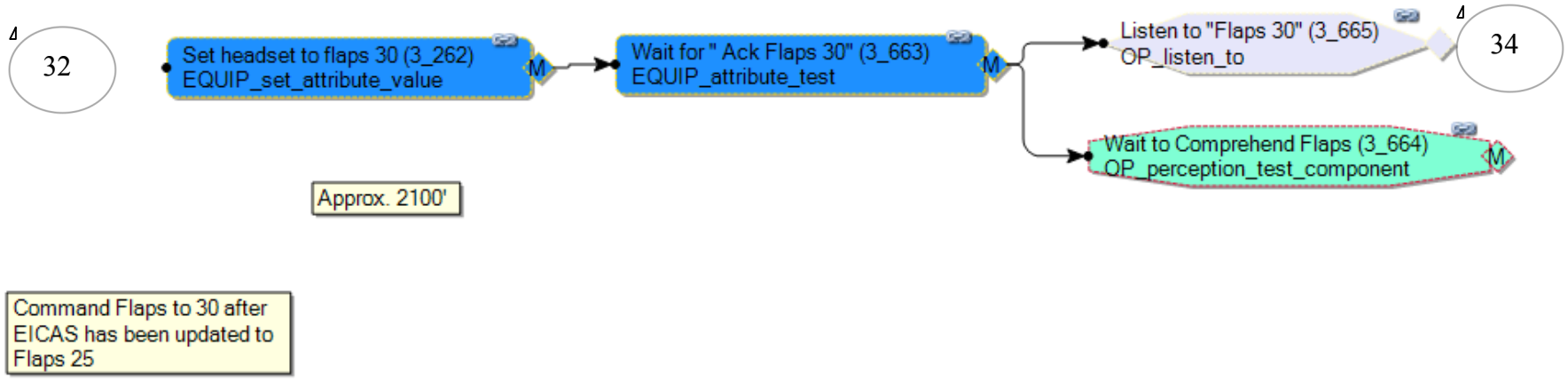


Figure 33. PF/CA confirmation of flaps 30 settings.

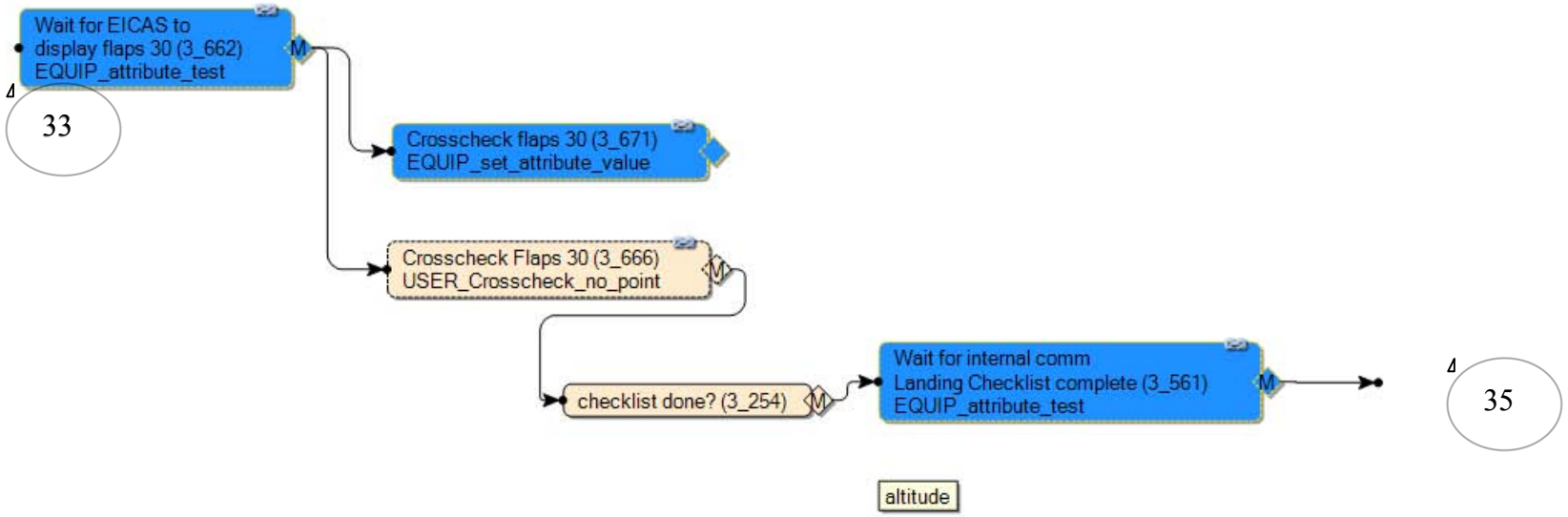


Figure 34. PF/CA flaps 30 actions and cross checks.

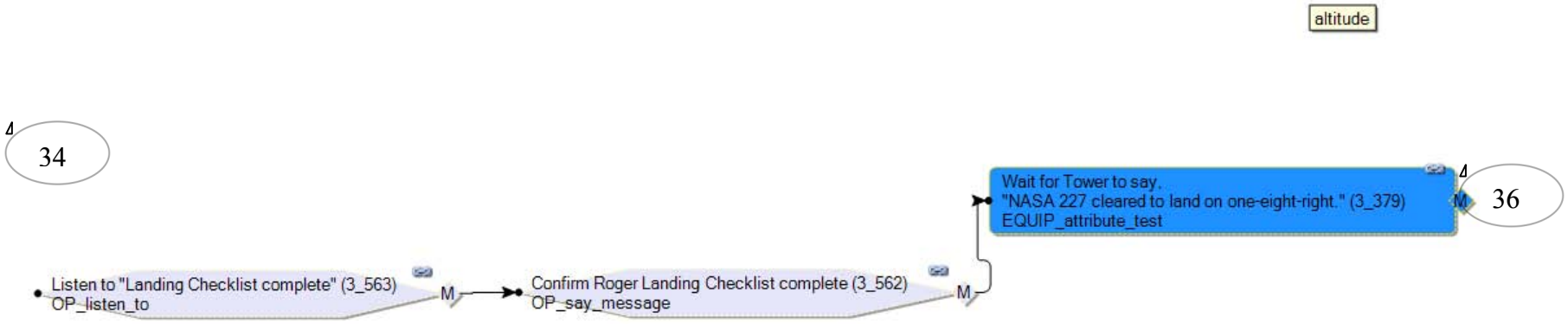


Figure 35. PF/CA confirmation that landing checklist is complete.

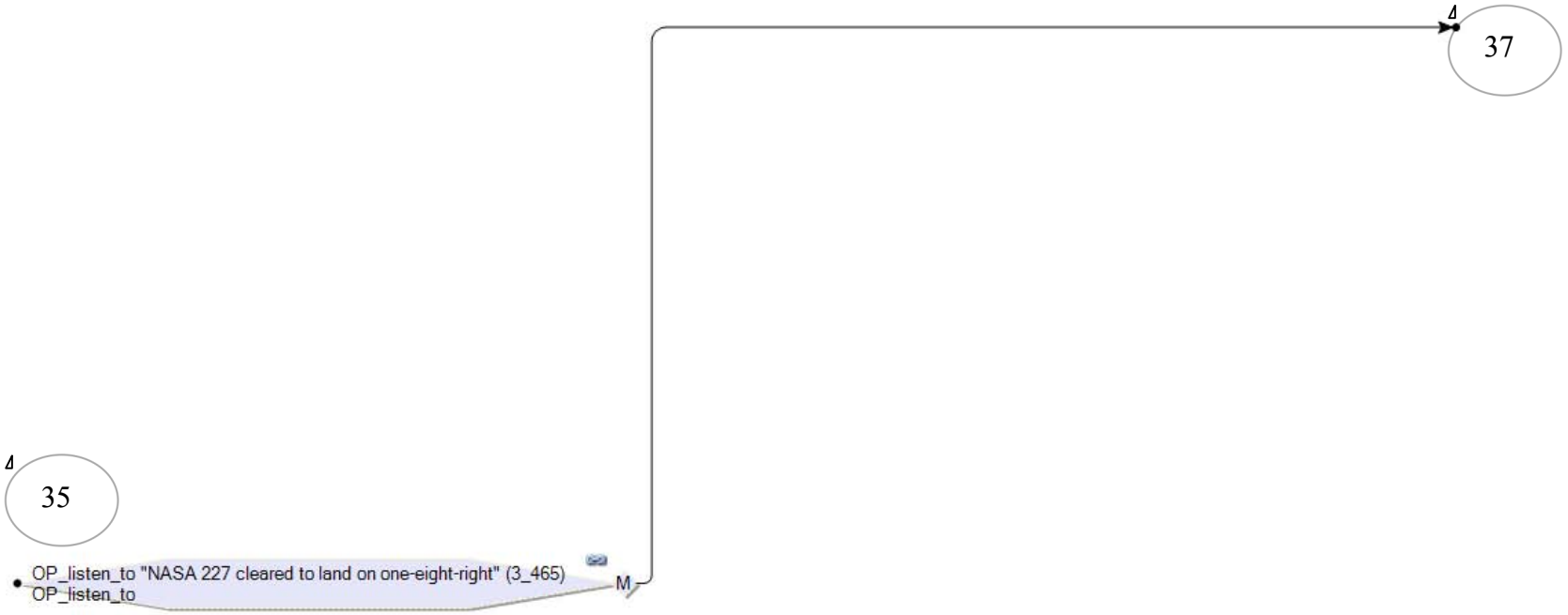


Figure 36. PF/CA listen to runway clearance task.

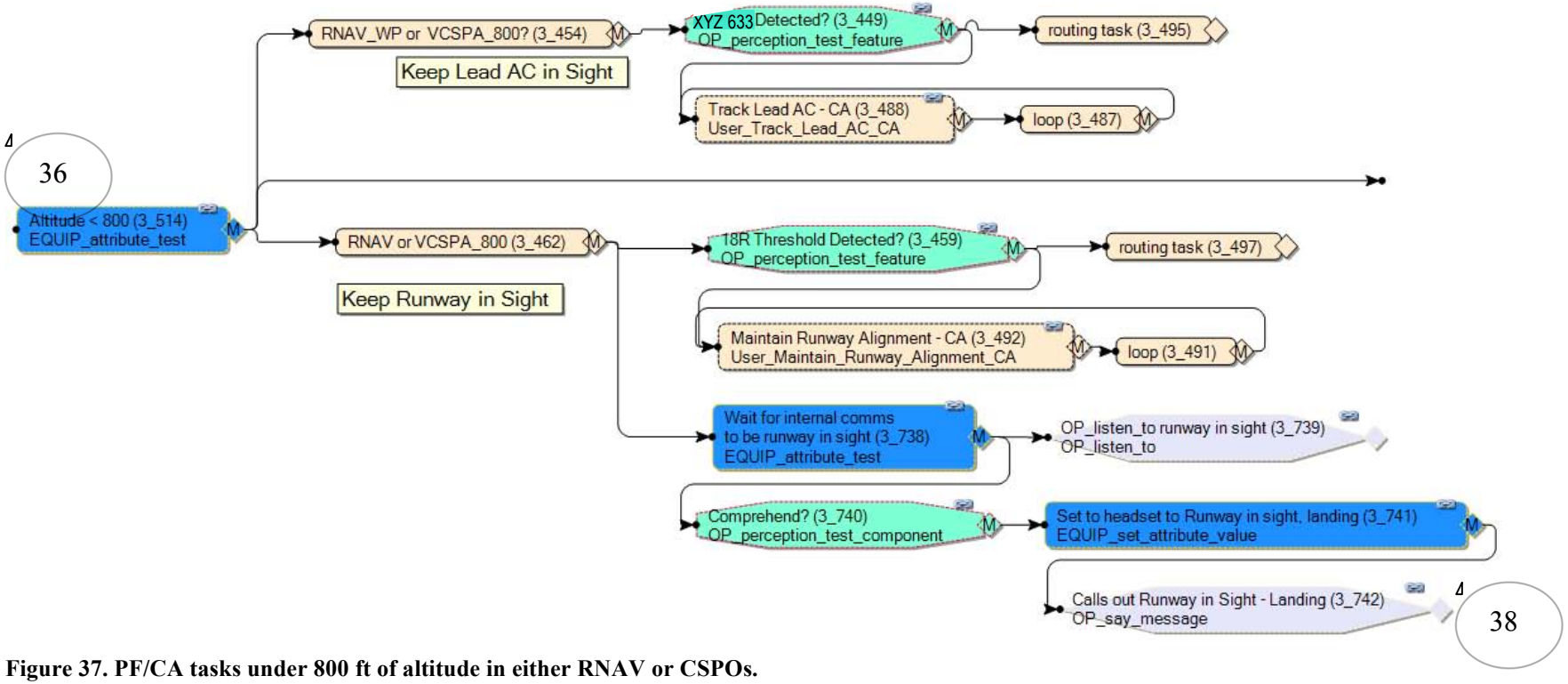


Figure 37. PF/CA tasks under 800 ft of altitude in either RNAV or CSPOs.

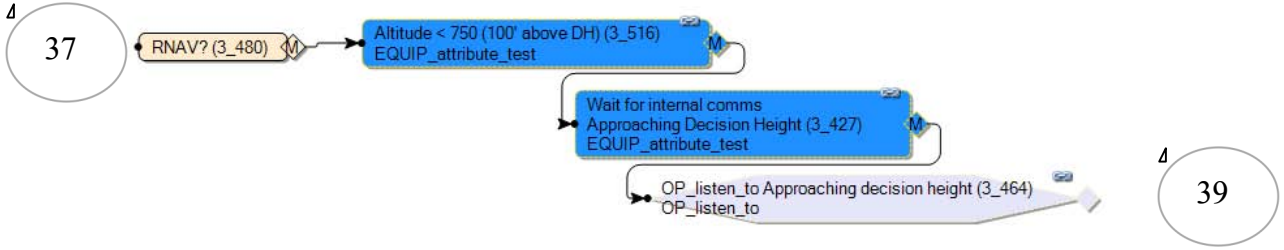


Figure 38. PF/CA RNAV tasks as Decision Height is reached.

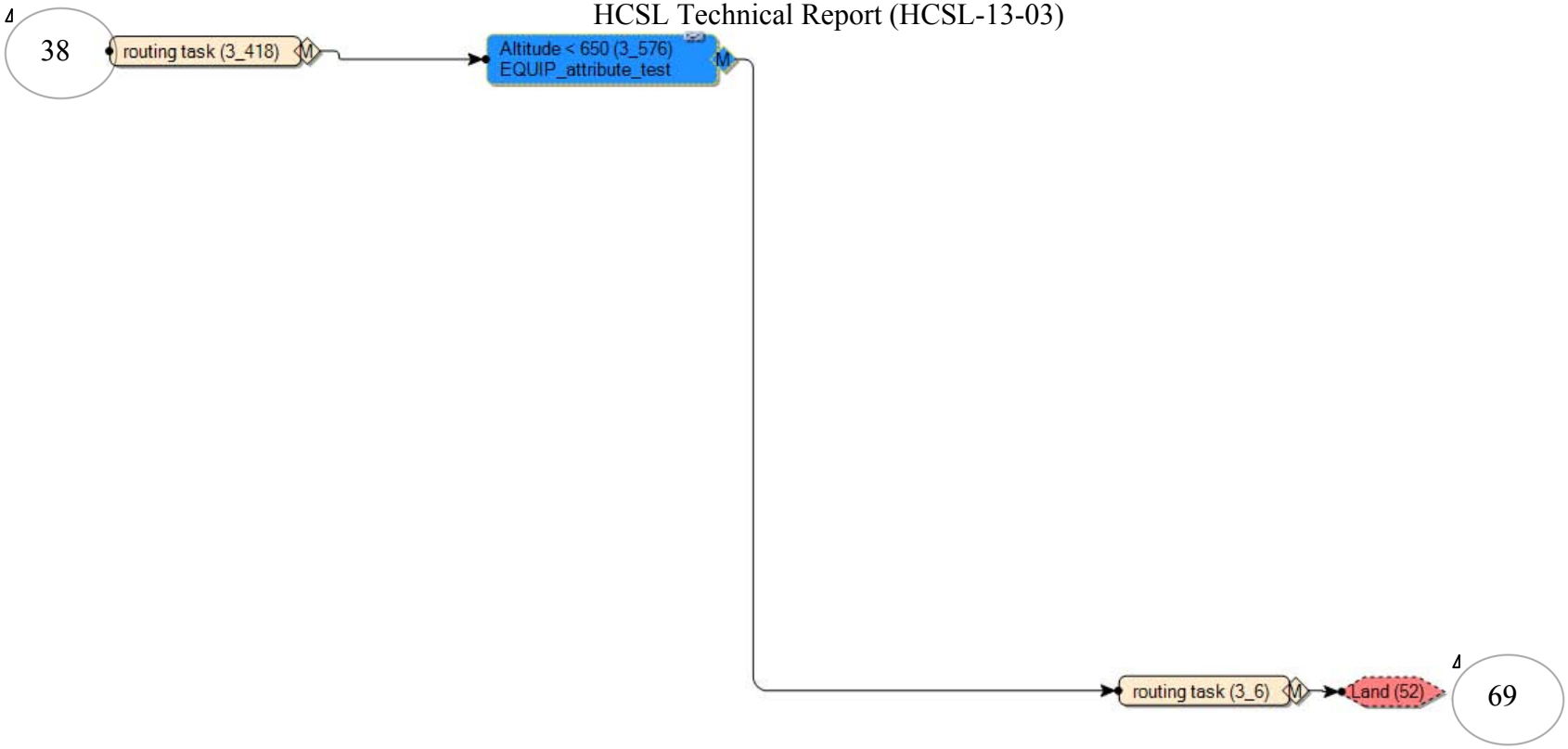


Figure 39. Final PF/CA attribute test required prior to entering land phase of flight.

PNF/FO Approach Task Network Model

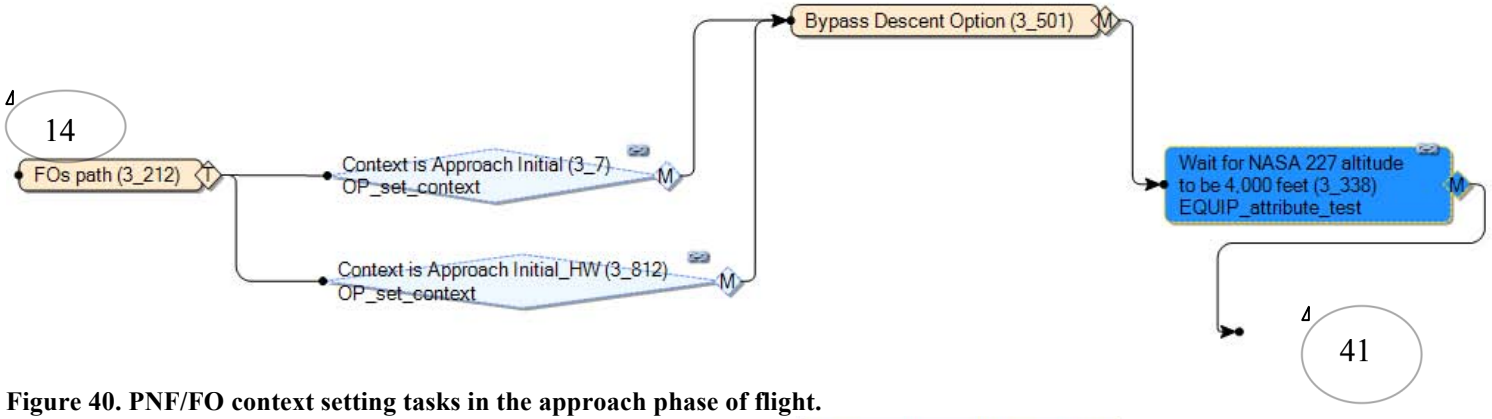


Figure 40. PNF/FO context setting tasks in the approach phase of flight.

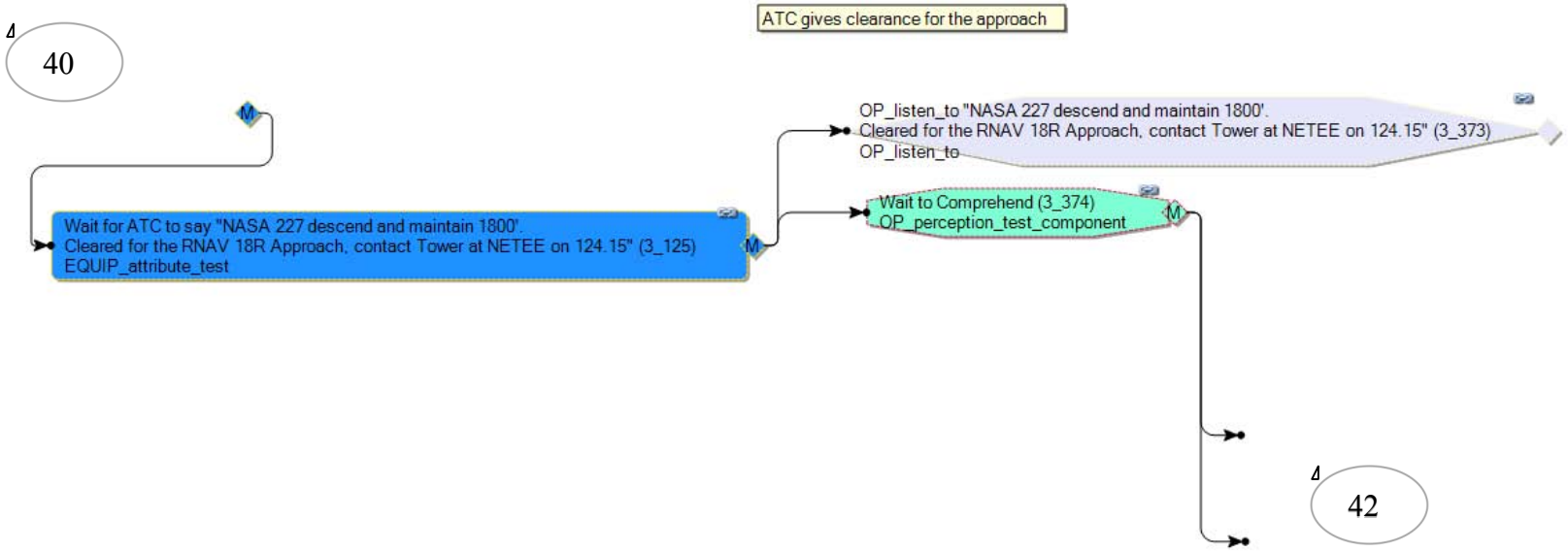


Figure 41. PNF/FO clearance receipt tasks in the descent phase of flight.

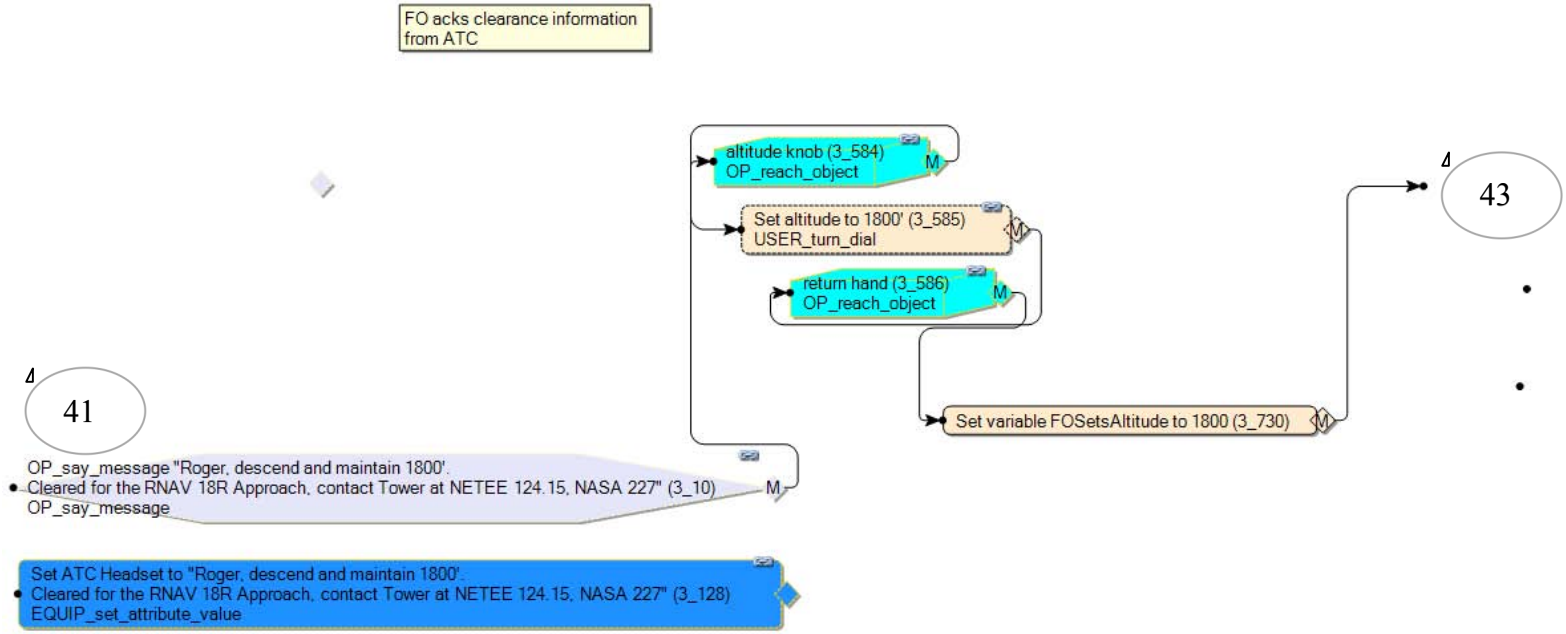


Figure 42. PNF/FO acknowledges the clearance from ATC.

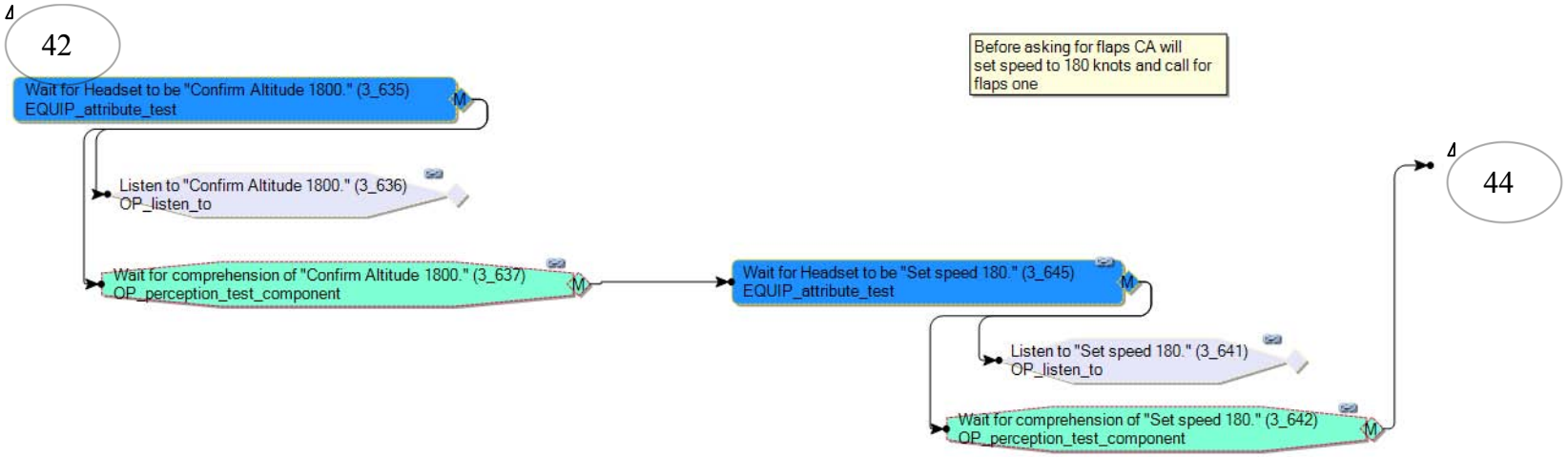


Figure 43. PNF/FO confirming altitude and setting speed.

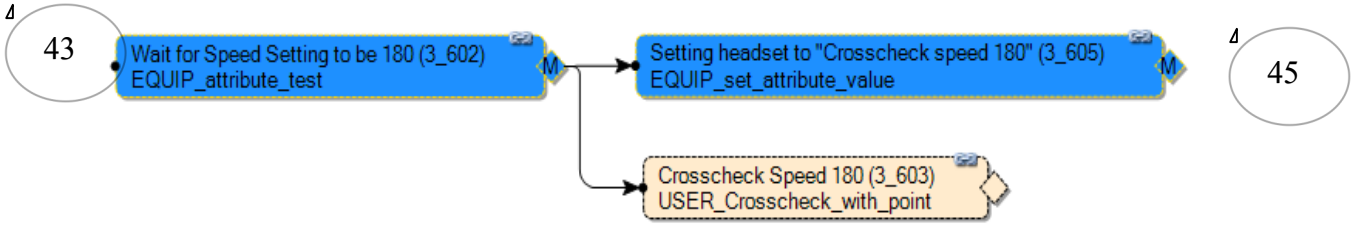


Figure 44. PNF/FO Speed confirmation task.

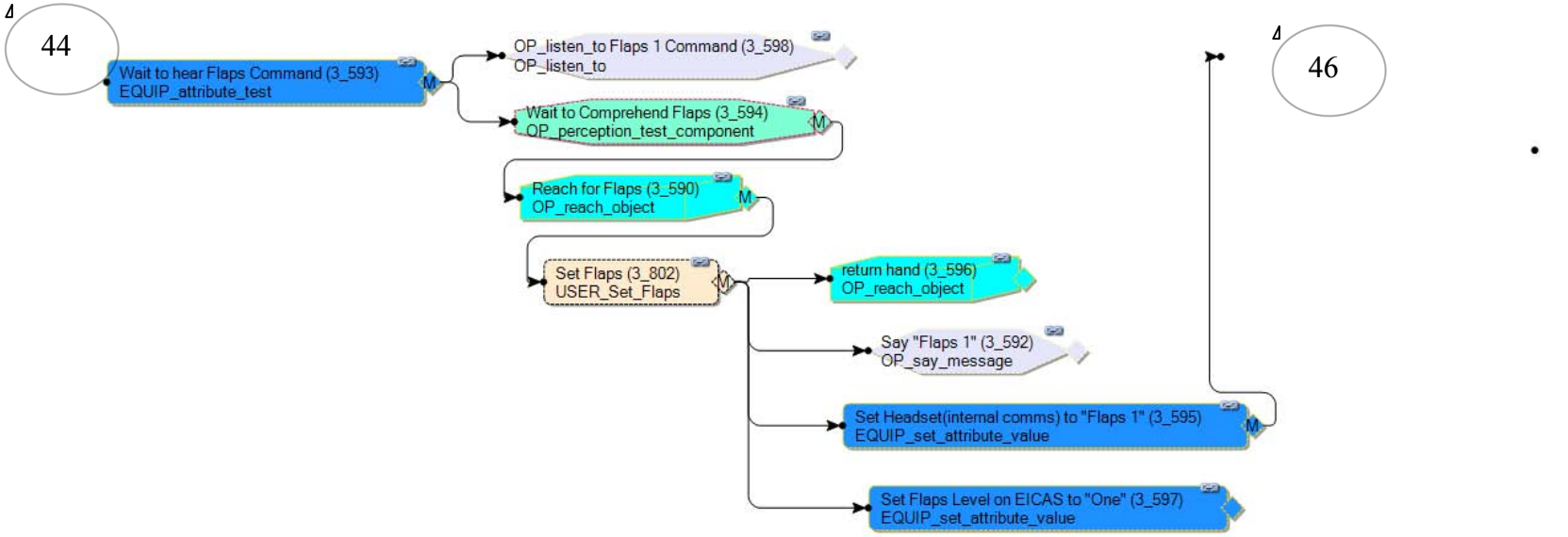


Figure 45. PNF/FO wait to hear flaps 1 command.

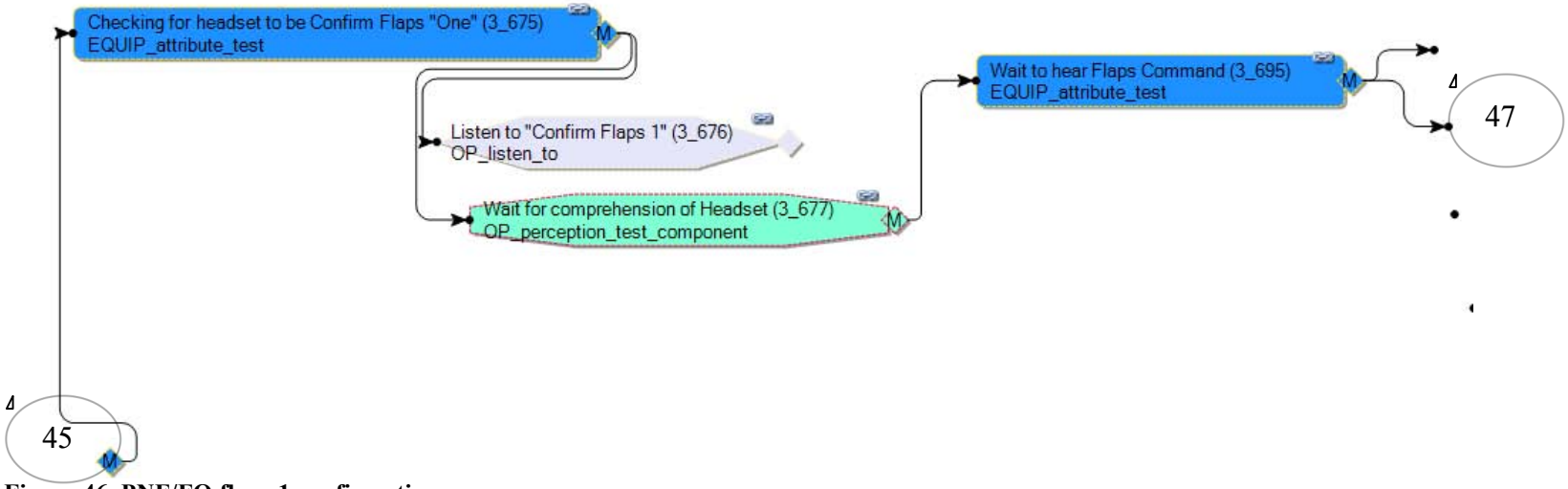


Figure 46. PNF/FO flaps 1 confirmation sequence.

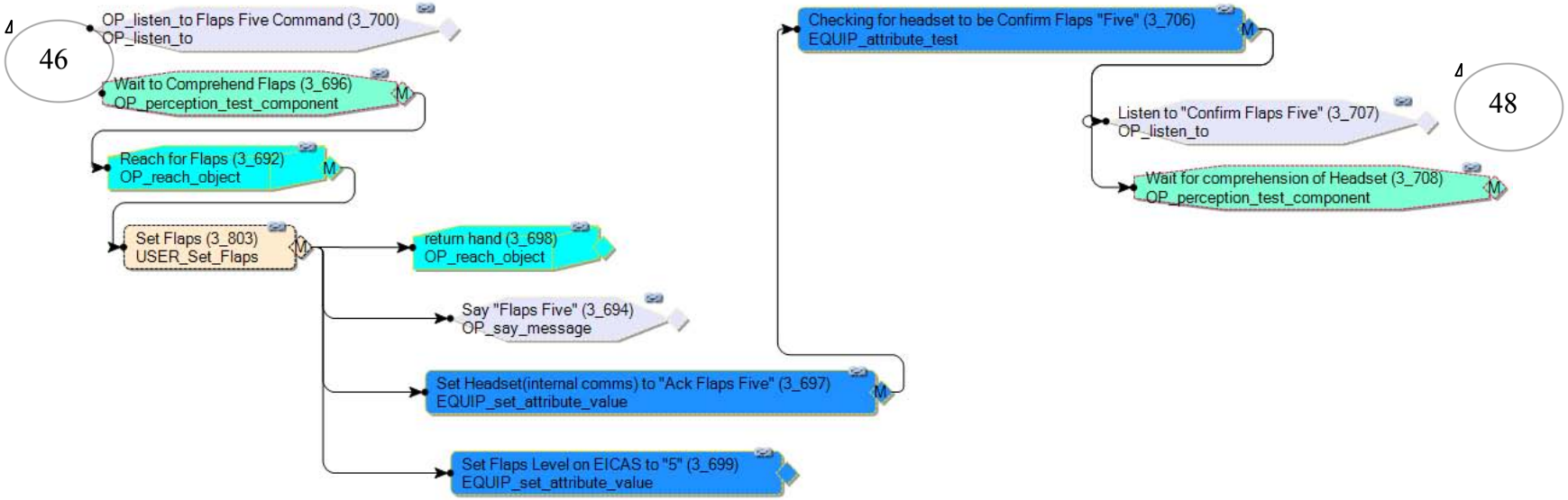


Figure 47. PNF/FO Flaps 5 command and action sequence.

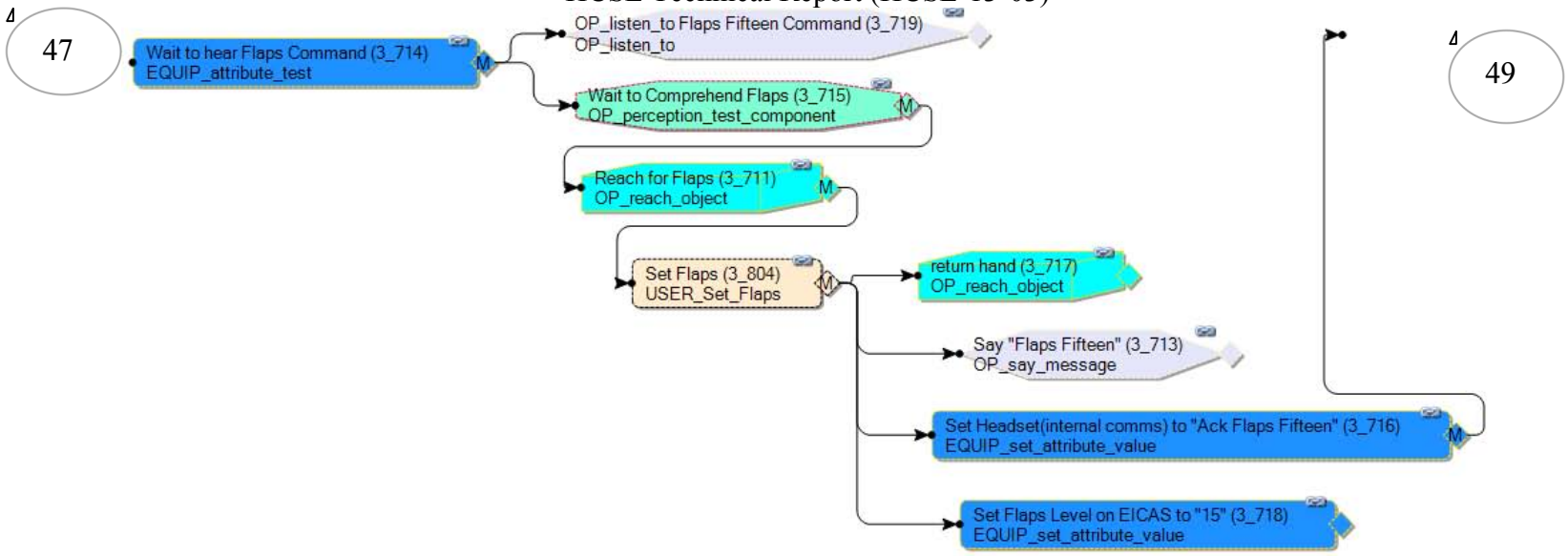


Figure 48. PNF/FO Flaps 15 command and action sequence.

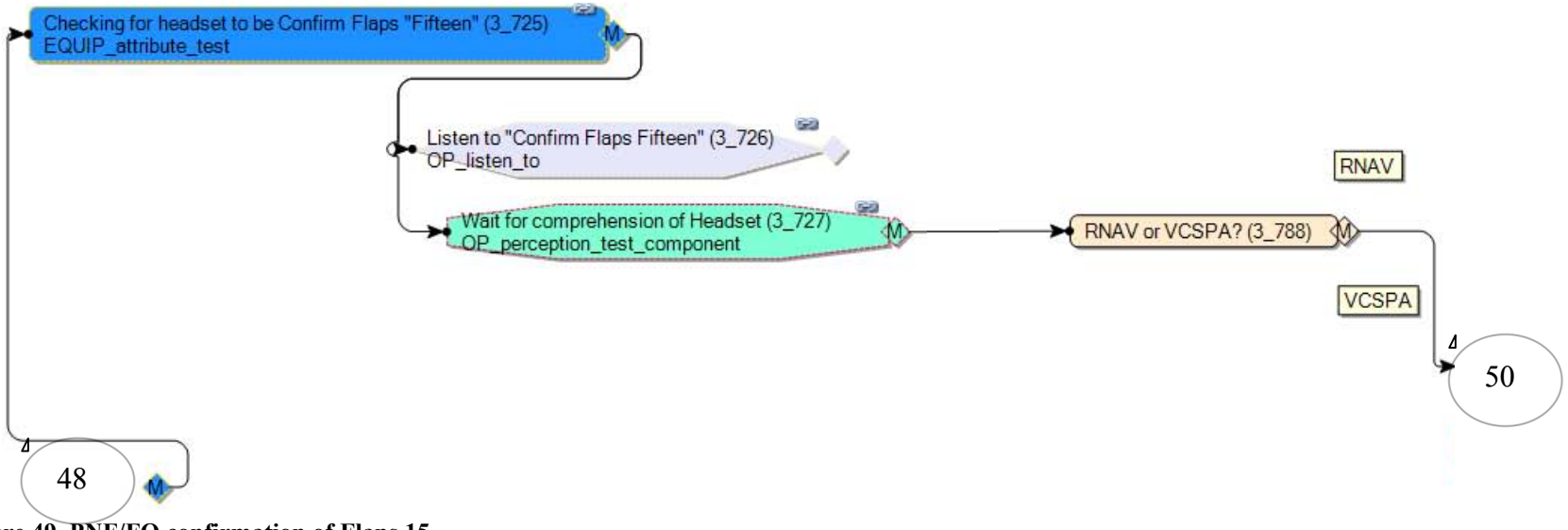


Figure 49. PNF/FO confirmation of Flaps 15.

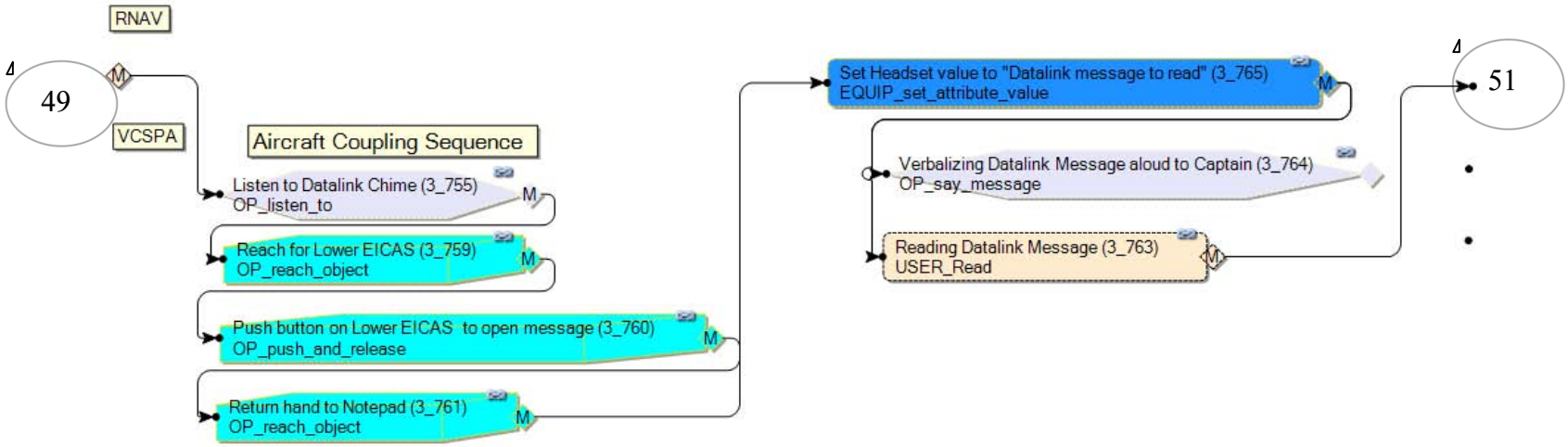


Figure 50. PNF/FO aircraft coupling action sequence.

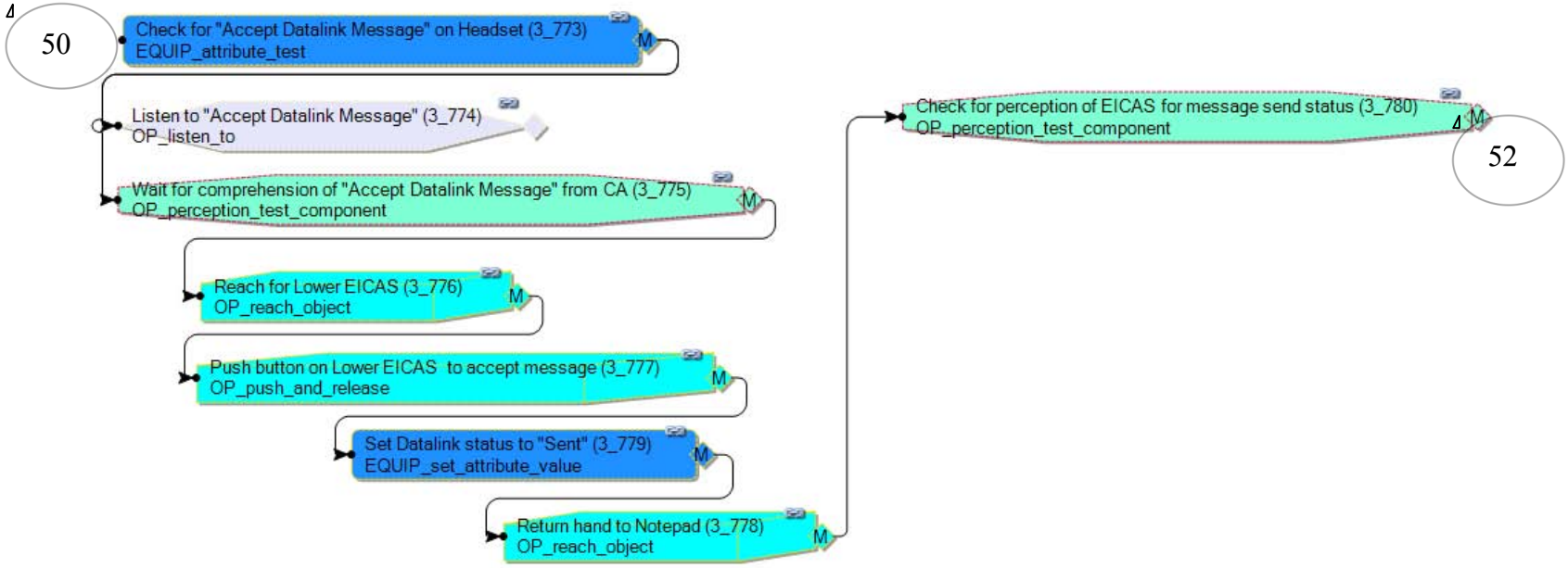


Figure 51. PNF/FO aircraft coupling action sequence.

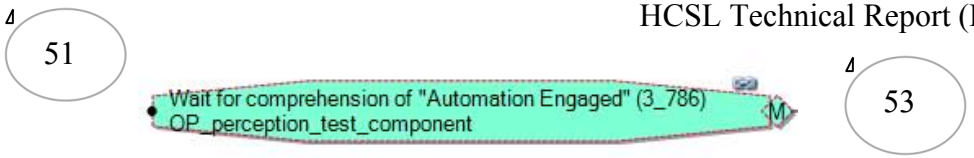


Figure 52. PNF/FO wait for automation engage portion of the aircraft coupling action sequence.

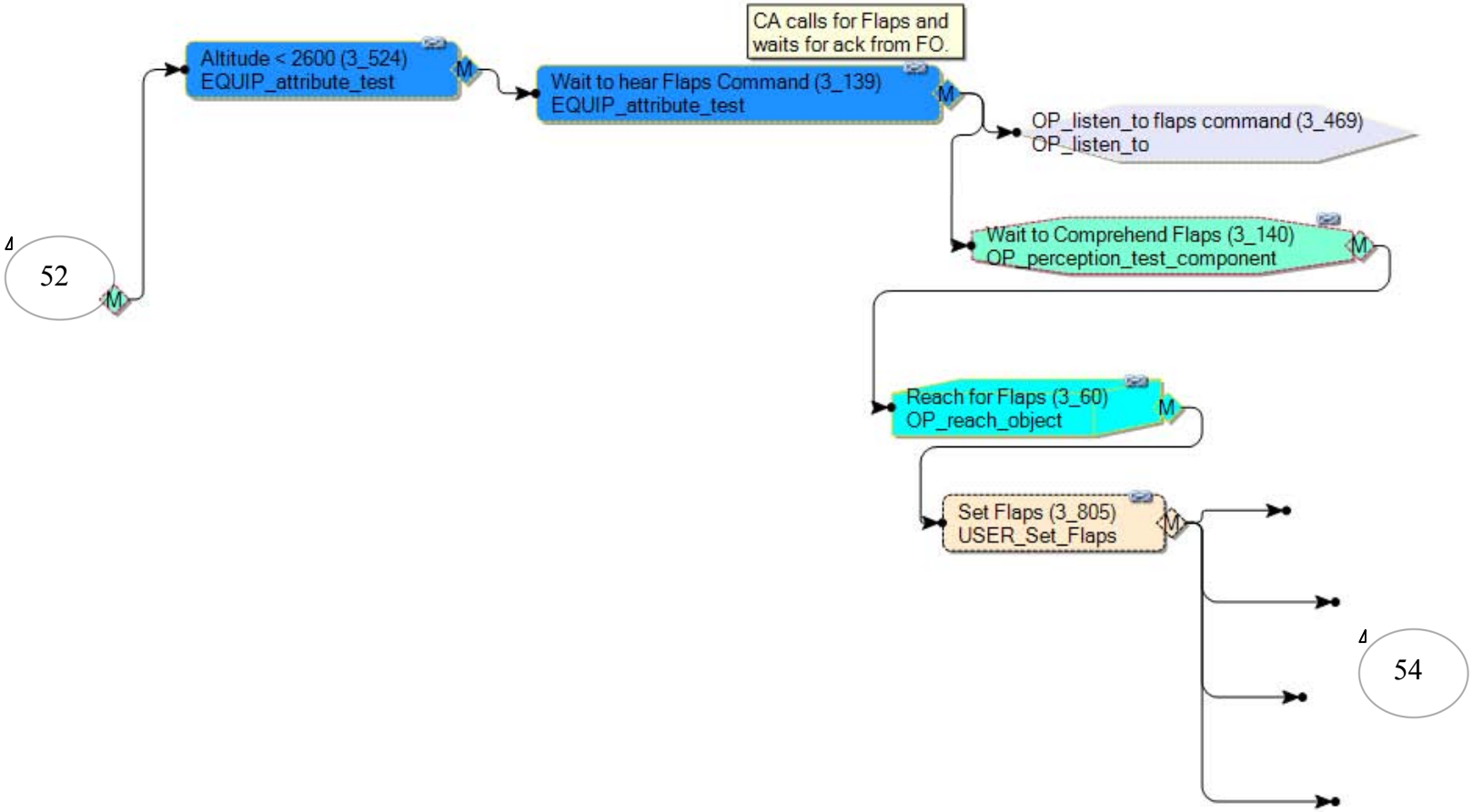


Figure 53. PNF/FO set flaps action sequence.

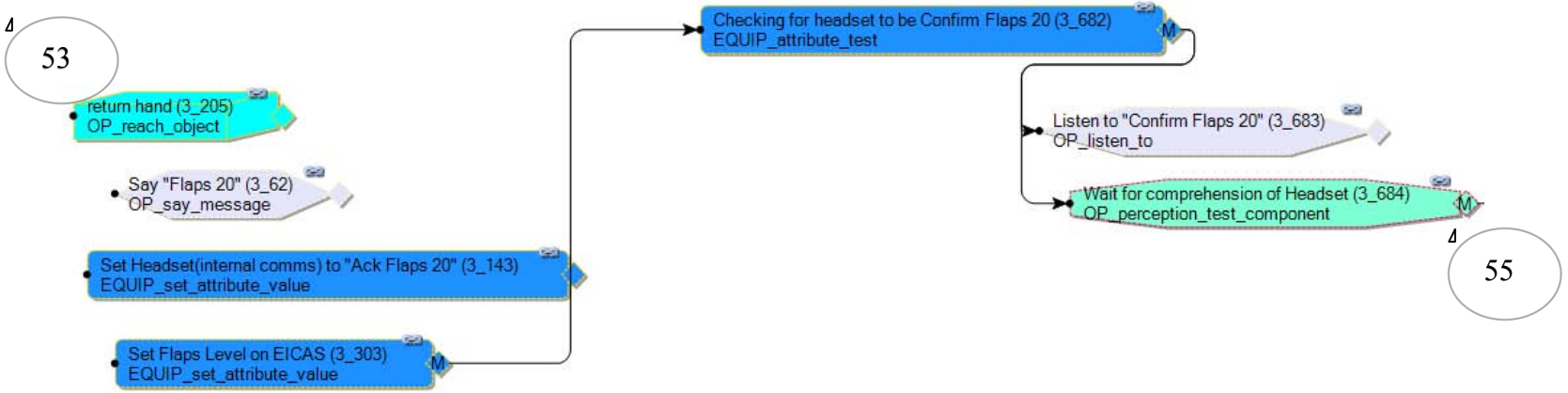


Figure 54. PNF/FO confirm flaps 20 action sequence.

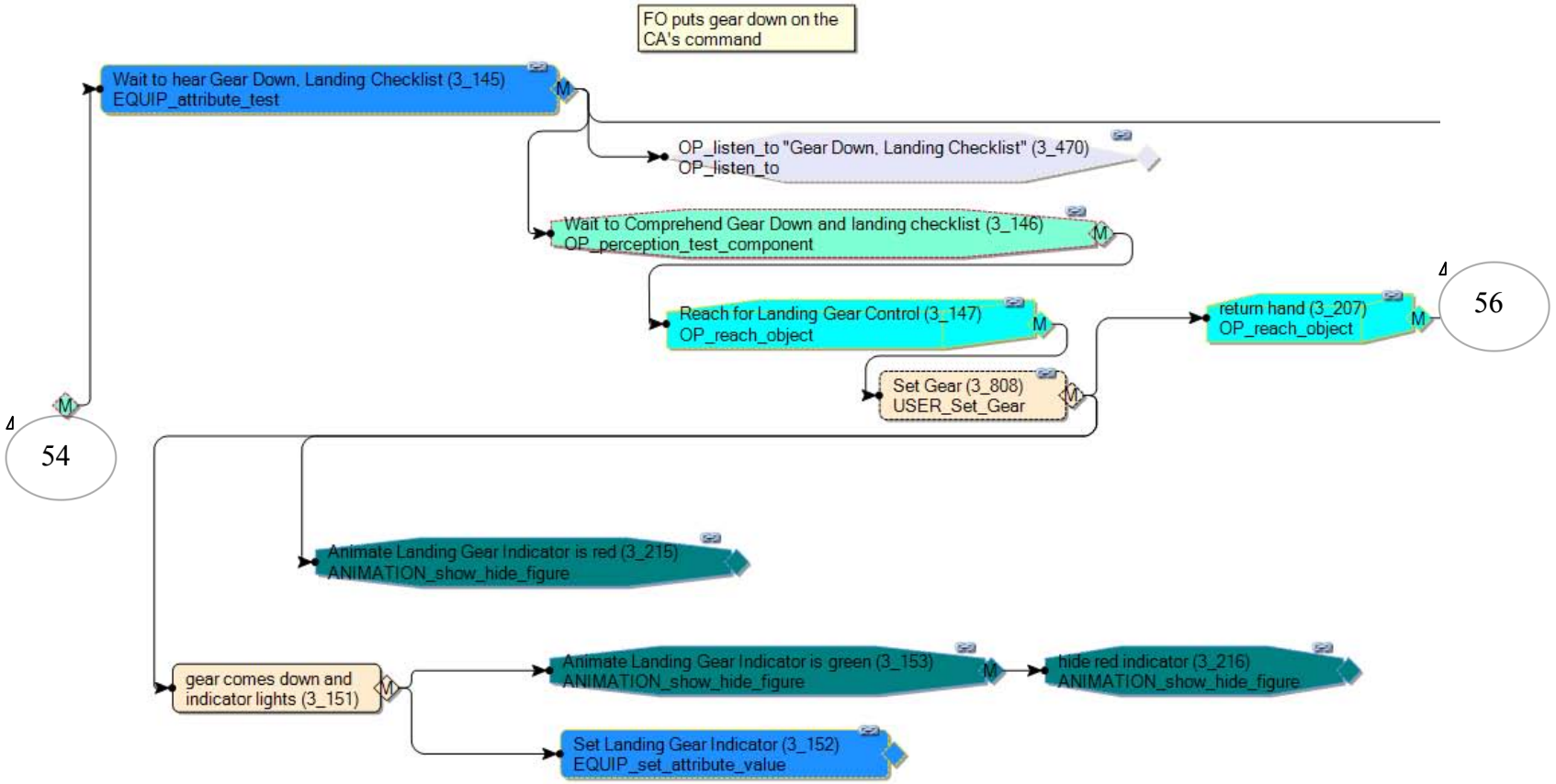


Figure 55. PNF/FO gear down action sequence.

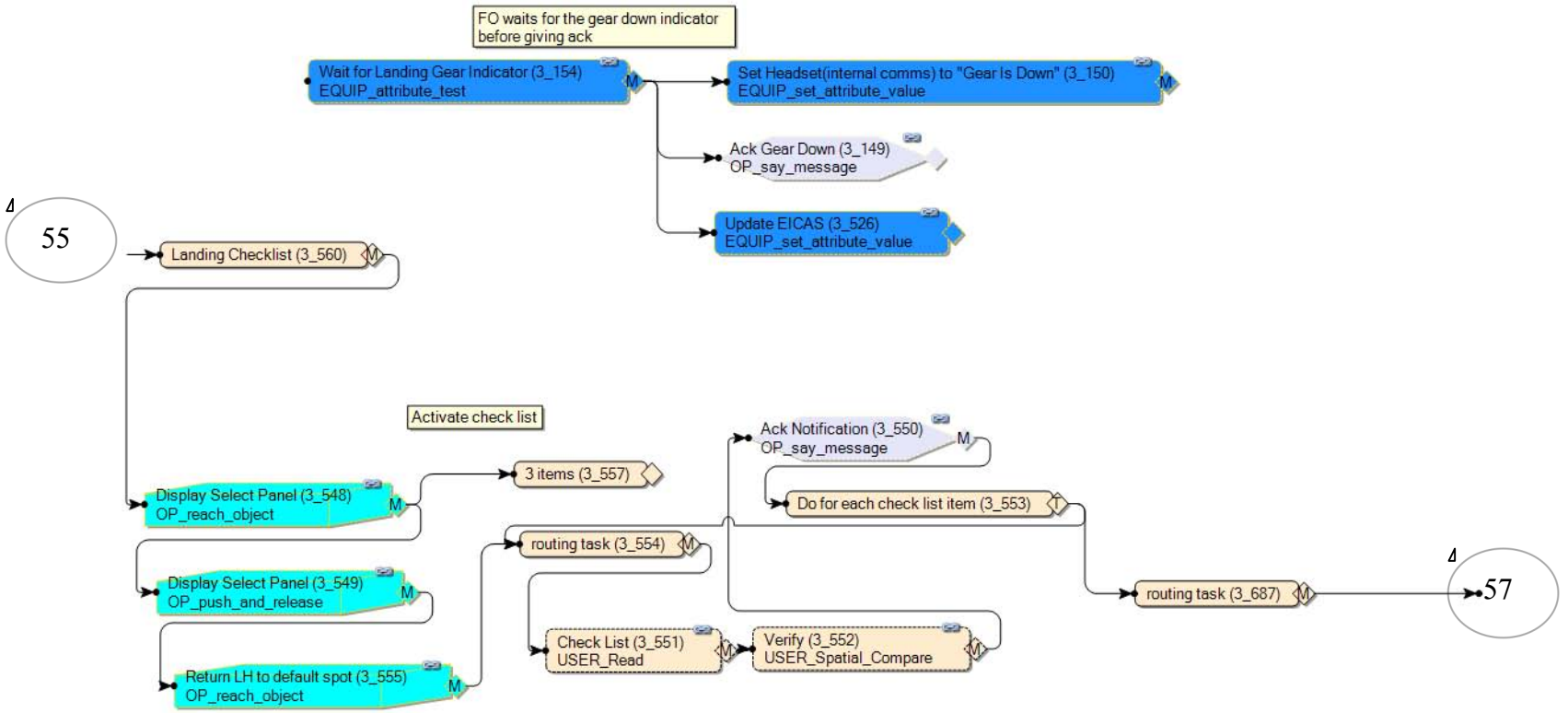


Figure 56. PNF/FO landing checklist and concurrent gear down confirmation sequence.

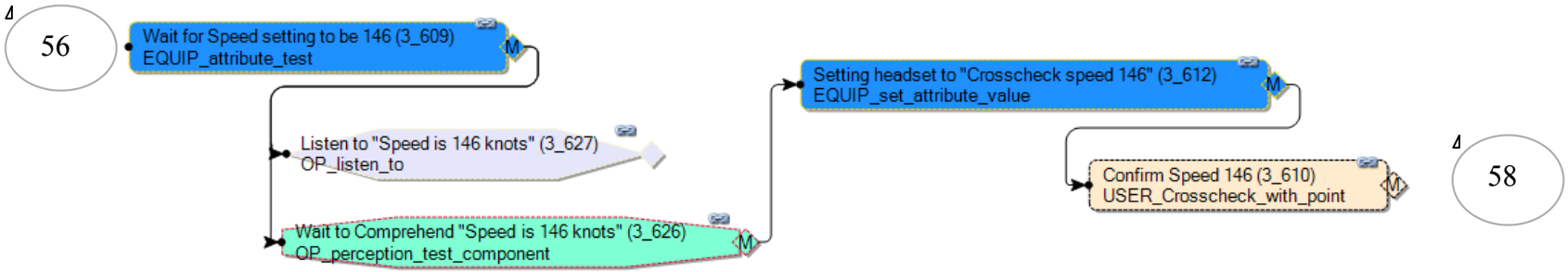


Figure 57. PNF/FO aircraft speed setting sequence.

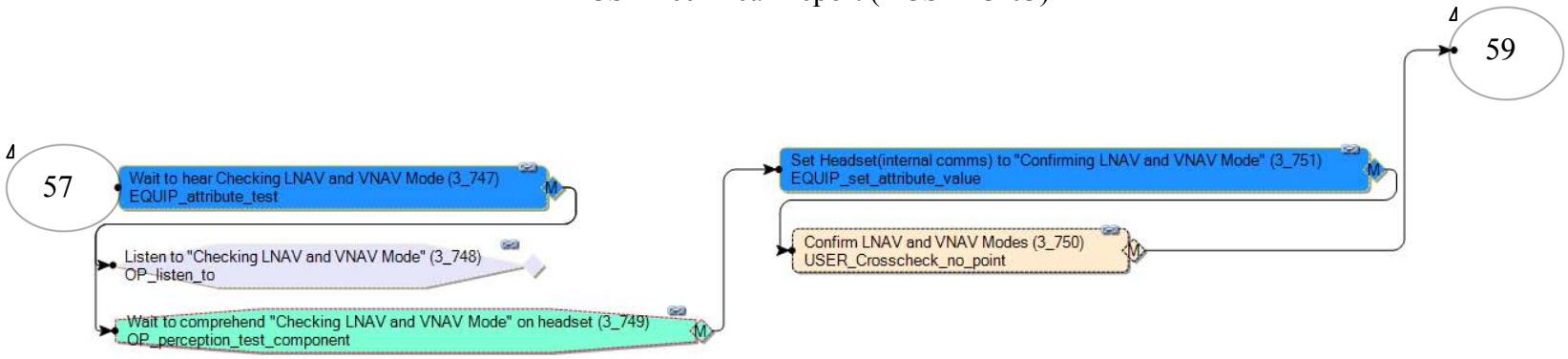


Figure 58. PNF/FO aircraft LNAV/VNAV mode confirmation action sequence.

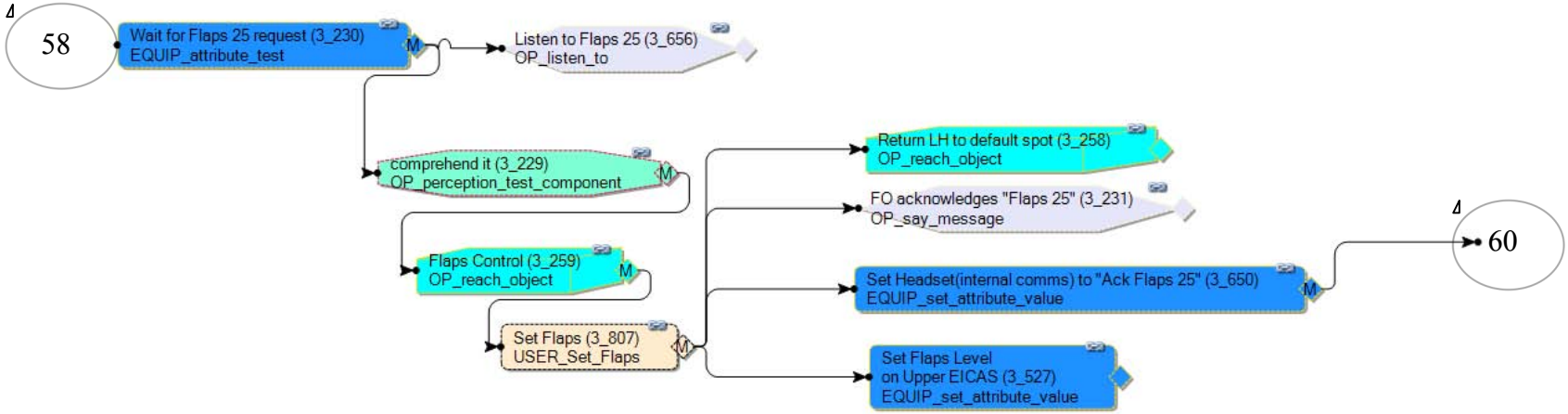


Figure 59. PNF/FO flaps 25 action sequence.

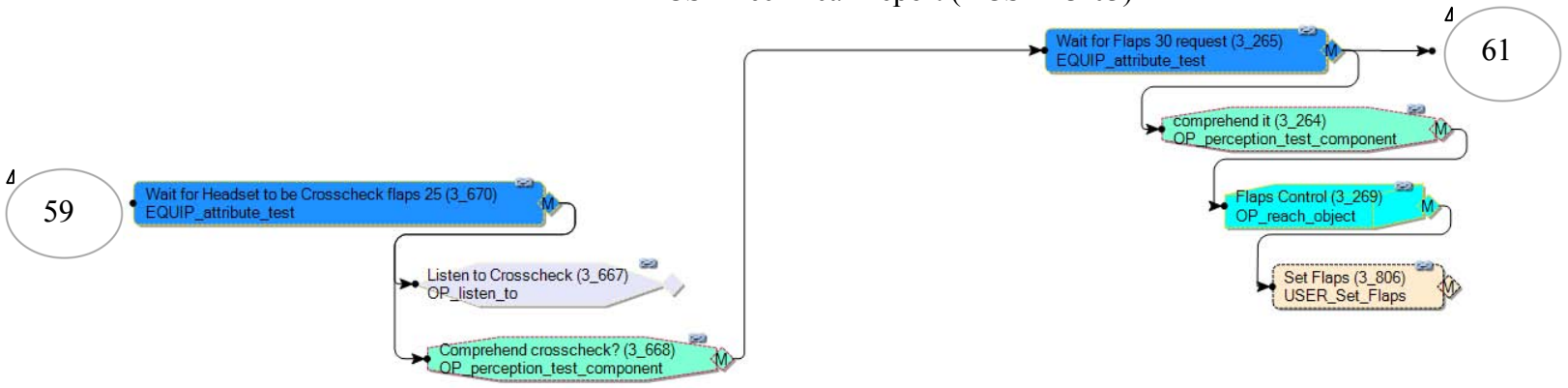


Figure 60. PNF/FO flaps 25 cross check and flaps 30 setting action sequence.

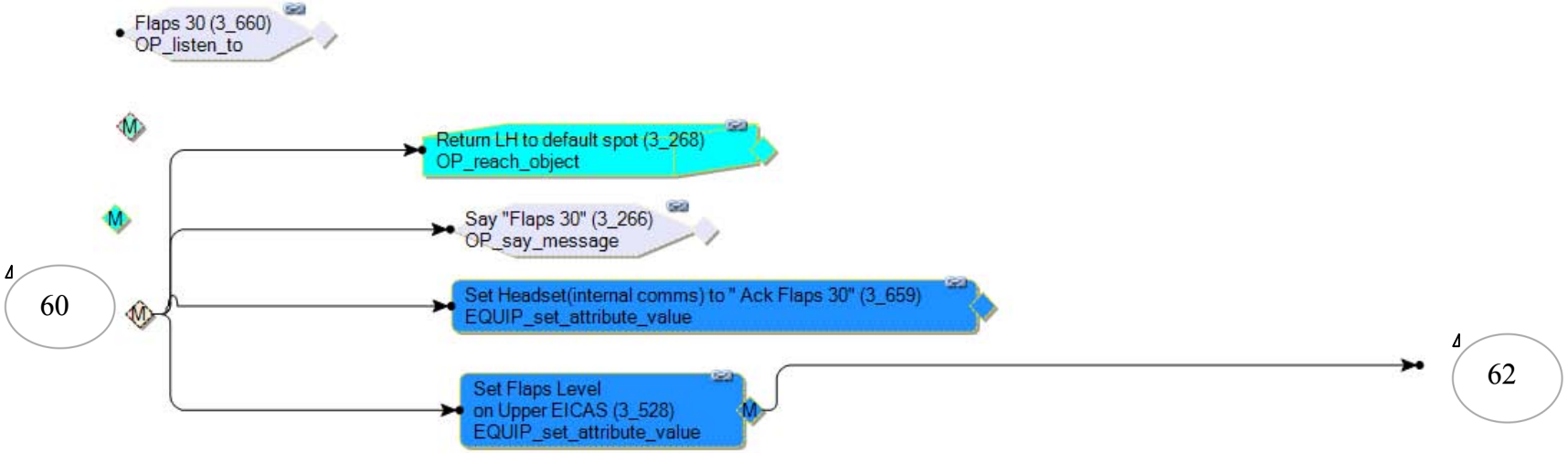


Figure 61. PNF/FO flaps 30 action sequence.

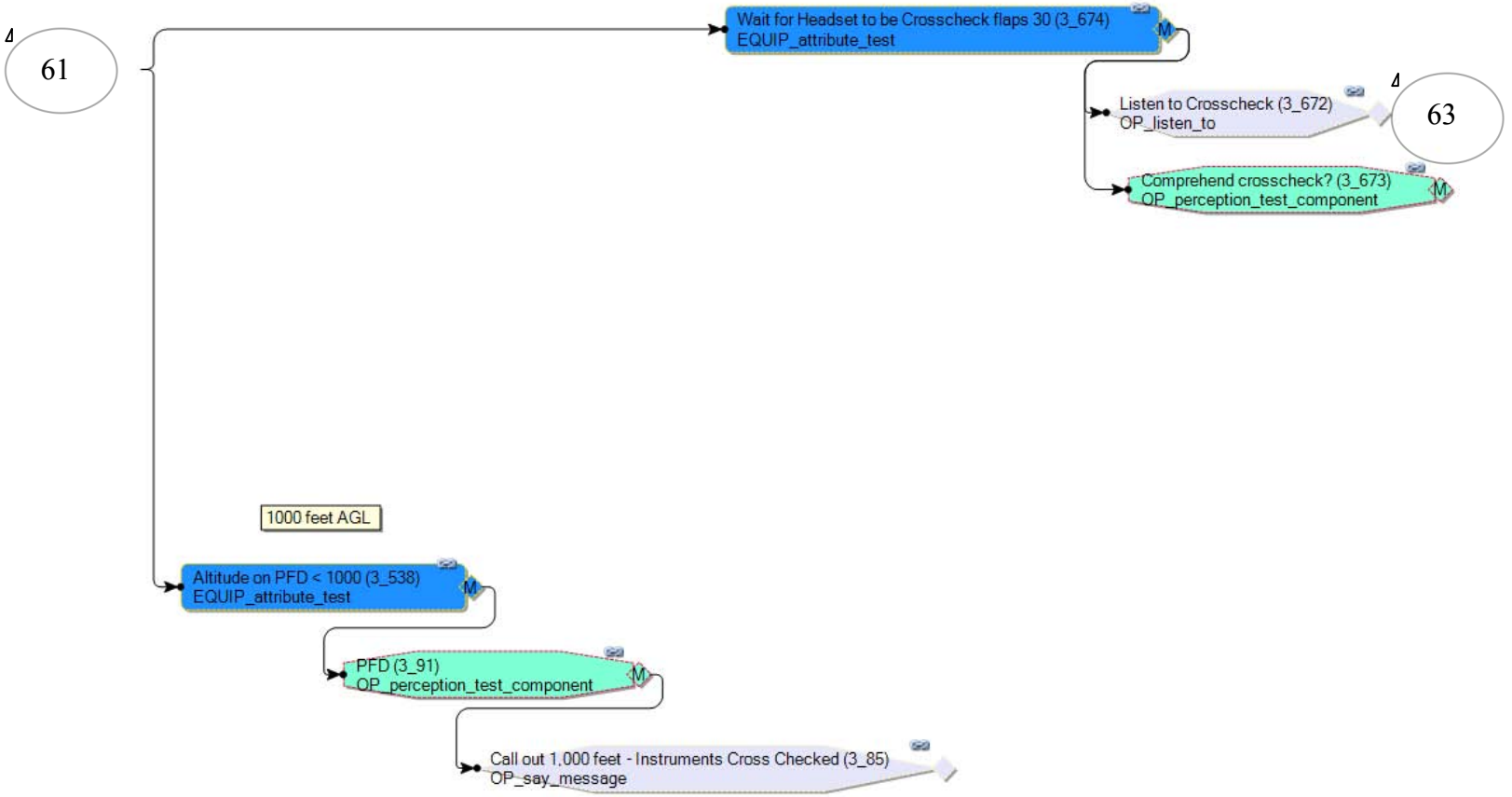


Figure 62. PNF/FO 1000 ft agl and flaps 30 action sequence.

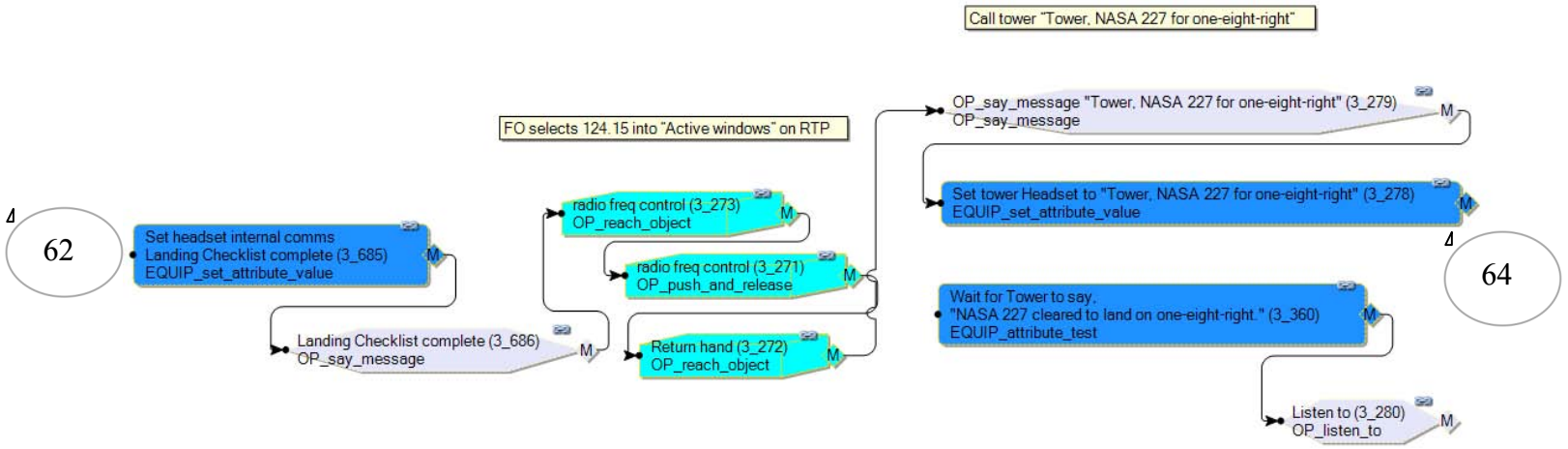


Figure 63. PNF/FO checklist complete and radio set for Tower action sequence.

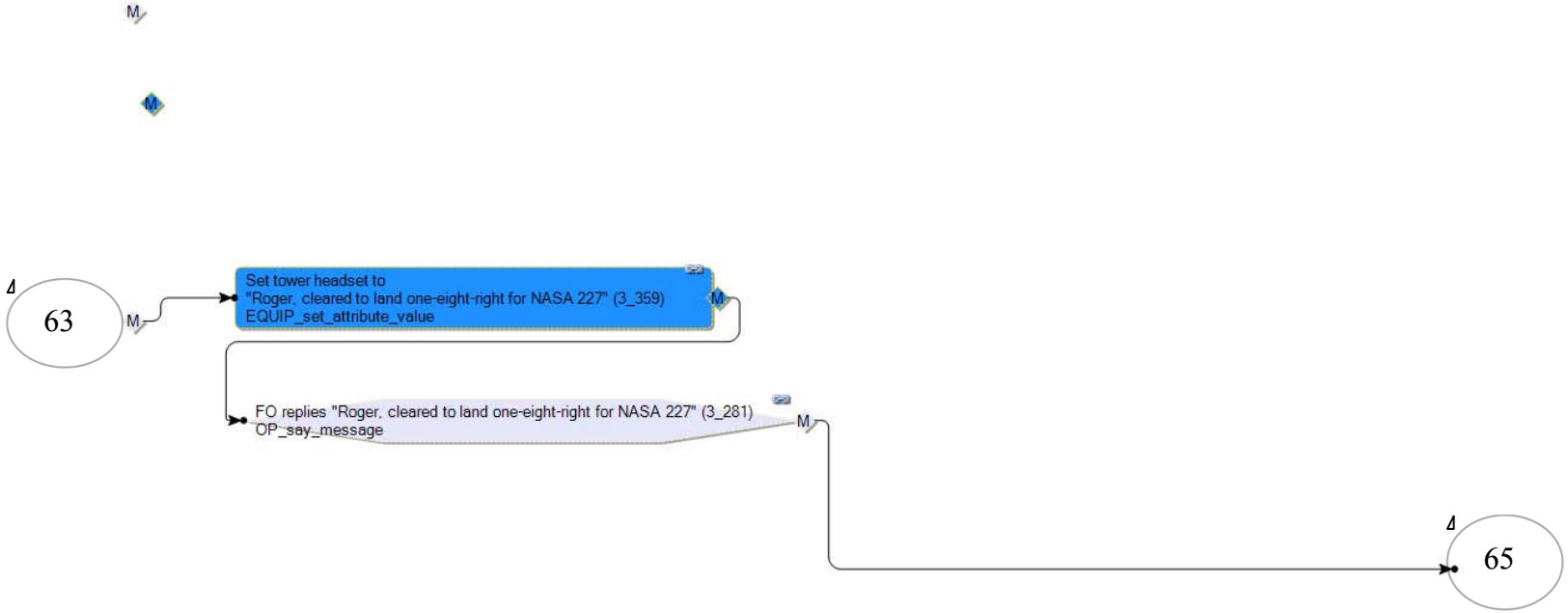


Figure 64. Clearance from Tower to PNF/FO.

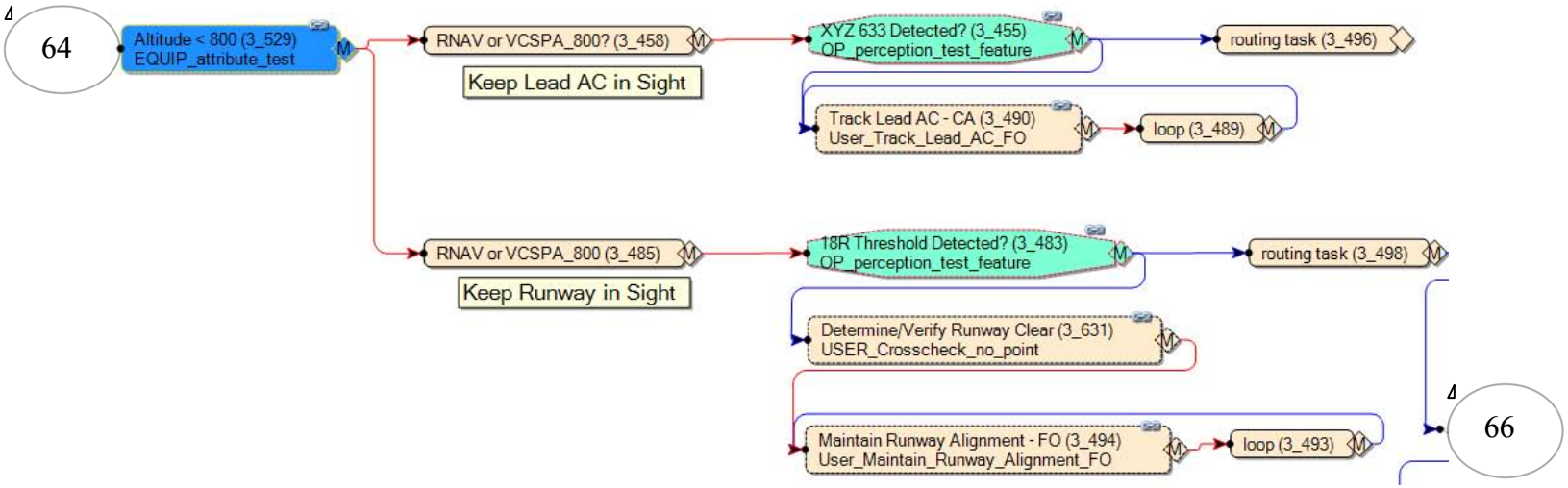


Figure 65. PNF/FO tasks under 800 ft of altitude in either RNAV or CSPOs.

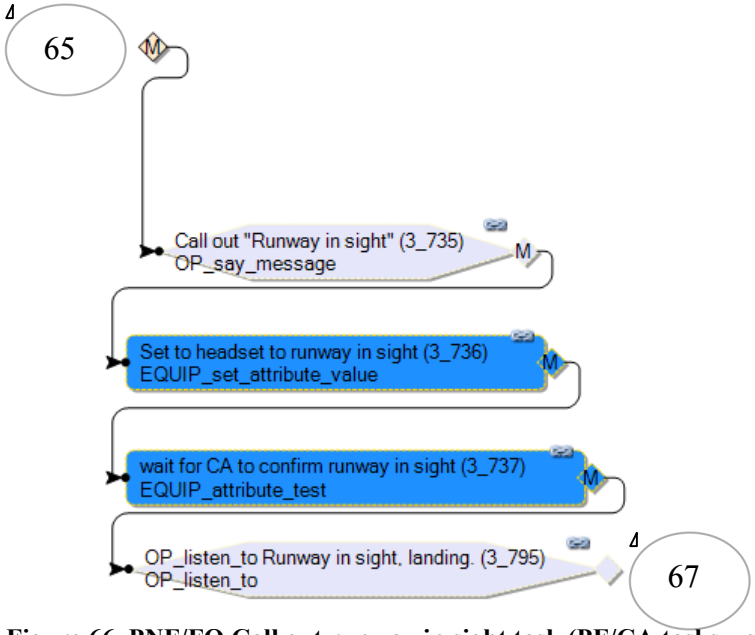


Figure 66. PNF/FO Call out runway in sight task (PF/CA tasks under 800 ft of altitude in either RNAV or CSPOs).

This then links back up with the PF/CAs tasks from Figure 39 prior to being routed to the land phase of flight.

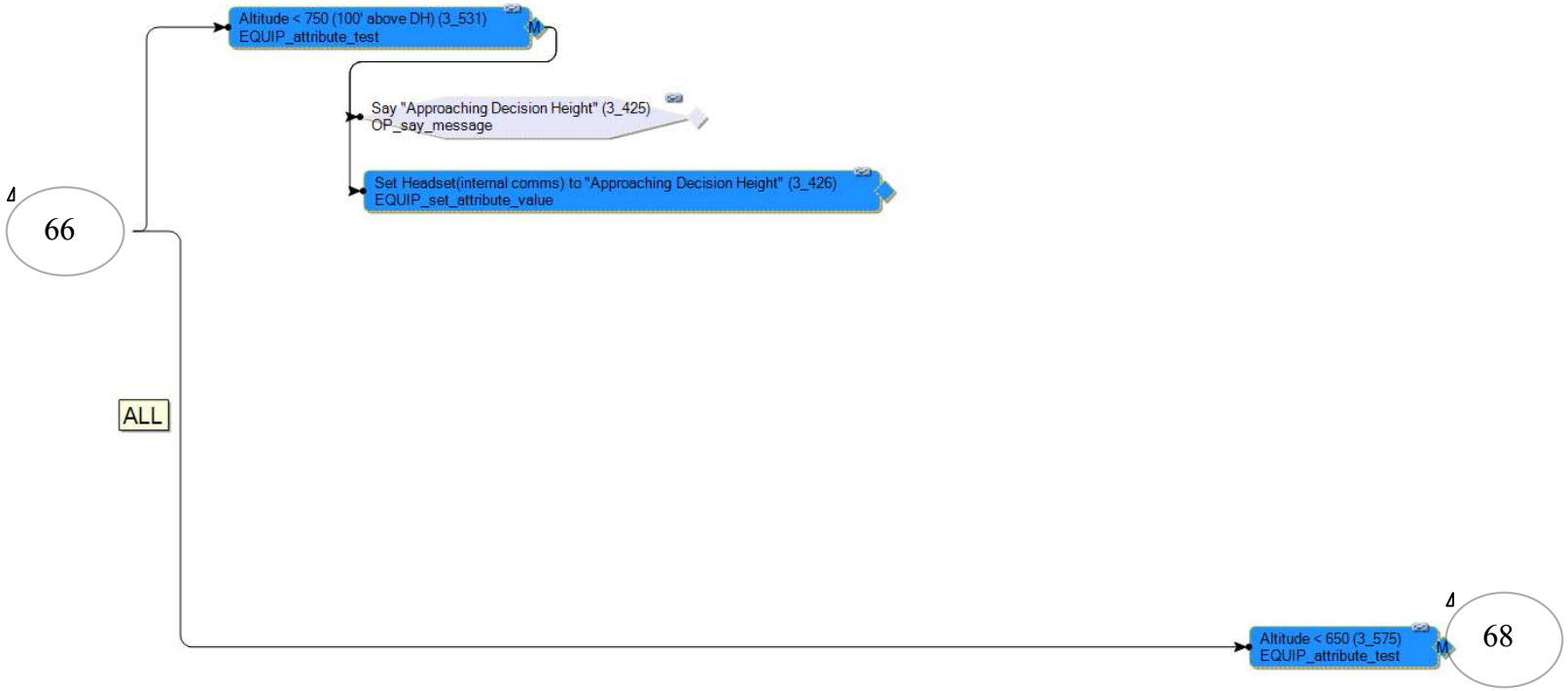


Figure 67. PNF/FO Decision Height call out PF/CA tasks under 800 ft of altitude in either RNAV or CSPOs.

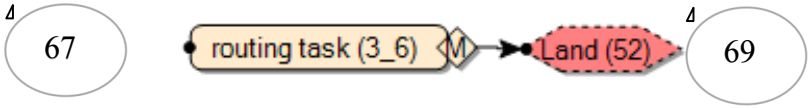


Figure 68. Routing task to the land phase of flight.

Land Phase of Flight

In the land phase, the crew prepares to land the aircraft. The PF/CA flies the 777 to the runway, flares to bring the main landing gear to the pavement, and then flies the nose to the runway. When the main gear contacts the runway, the speed brakes automatically deploy (as set during the Final Descent Checklist). The PF/CA tasks can be found in Figure 69 through Figure 82 (The CSPO 800' tasks can be found in Figure 69 through Figure 75, the CSPO 200' PF/CA tasks can be found in Figure 76 through Figure 82, while the PNF/FO tasks can be found in Figure 83 through Figure 86.

The Land portion of the flight is further broken down into the following two phases:
Land Initial. From 650' AGL to 200' AGL. It is in this portion of the land phase where the RNAV no Pair, RNAV with Pair and VCSPA-800 aircraft continue in VMC conditions, reach the decision height (DH) at 650' and disable the autopilot starting at 650' AGL. The crew flying the VCSPA-200 approach is still IMC and still on autoland during this portion of the landing. This is to identify similar time segments in both approaches for data comparison reasons.
Land Final. From 200' AGL to 0' AGL. At 200' the **VCSPA-200** approach begins to transition to VMC conditions for the first time with a decision height (DH) at 100'. The entire approach is completed with an autoland configuration. All aircraft fly the entirety of this portion of the Land phase in VMC conditions.

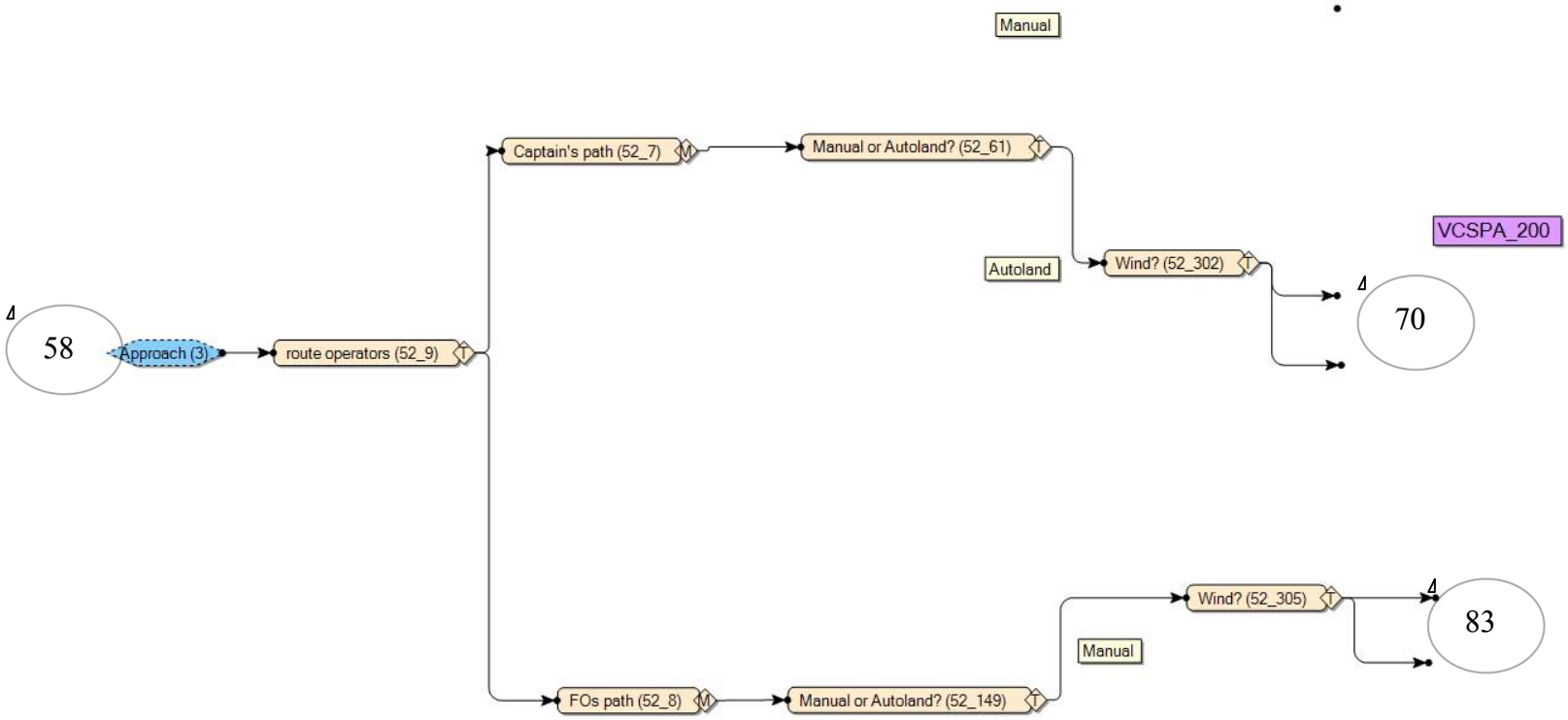


Figure 69. Routing of land tasks to either the PF/CA or the PNF/FO being further divided into wind/no wind condition and auto/manual land condition.

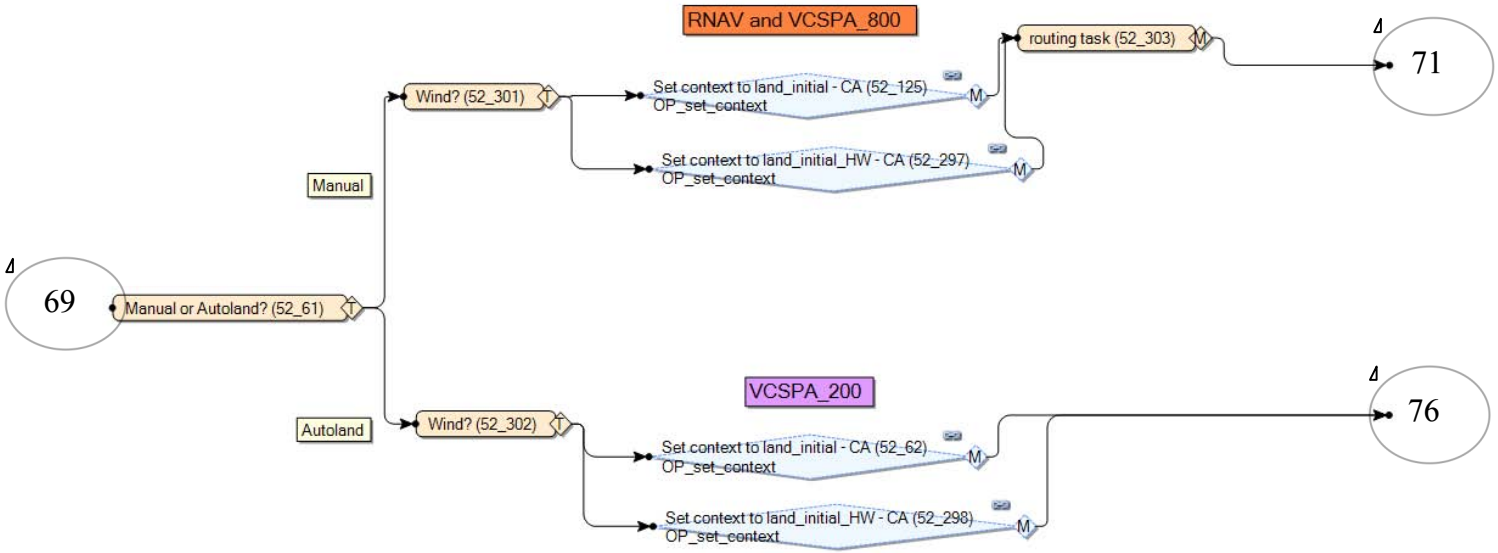


Figure 70. Setting the context for the land phase of flight.

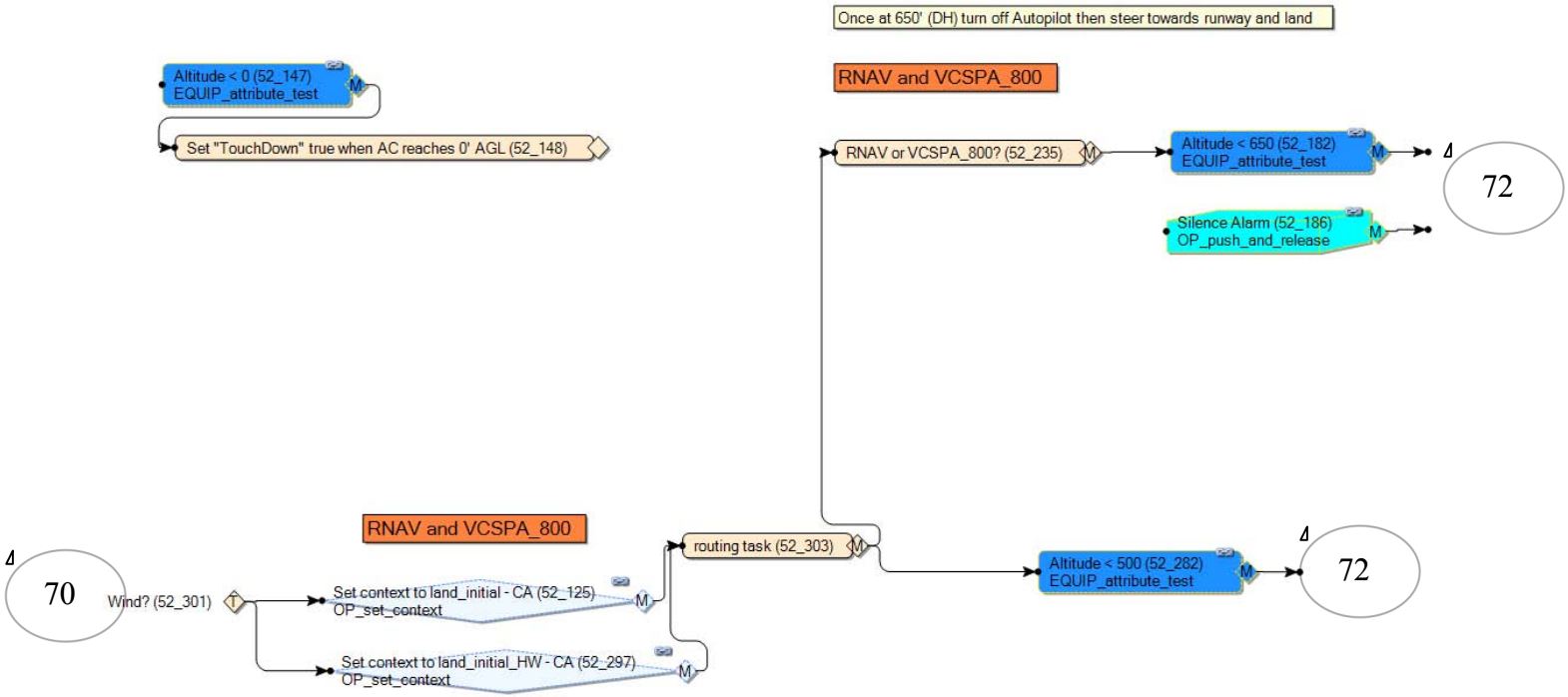


Figure 71. RNAV and CSPO 800 land phase of flight tasks under 800'.

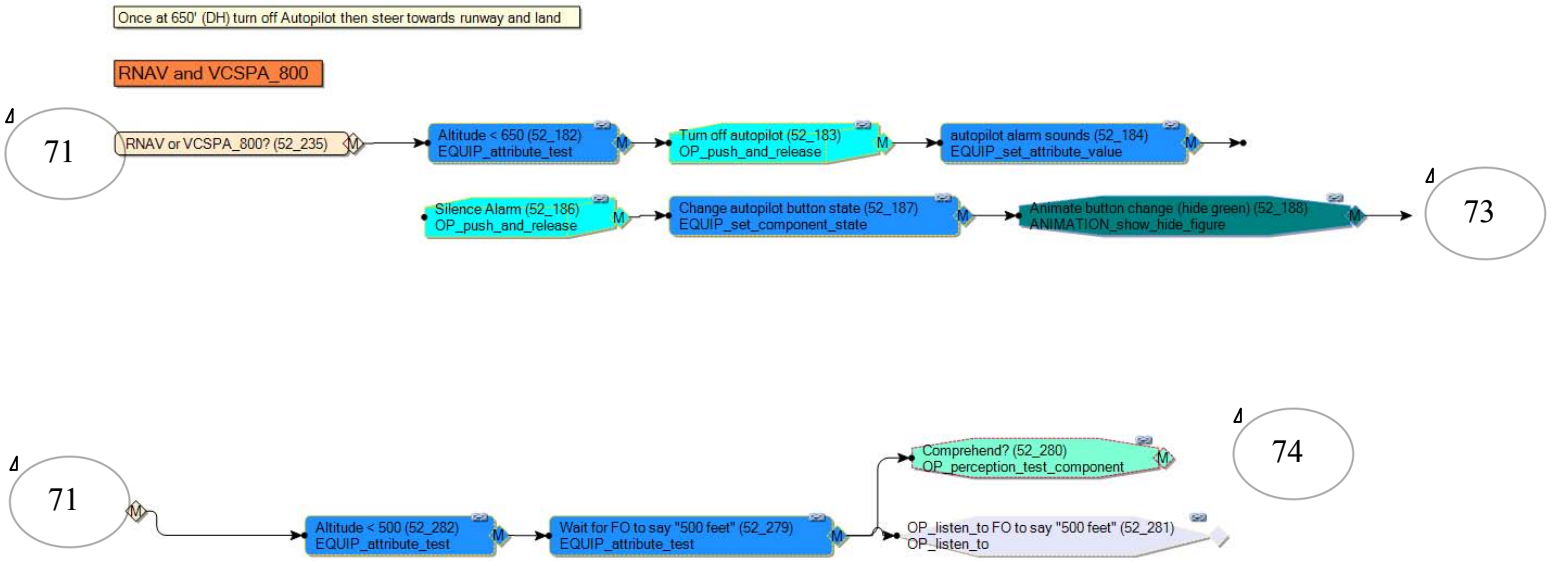


Figure 72. RNAV and CSPO 800 land phase of flight tasks under 650'.

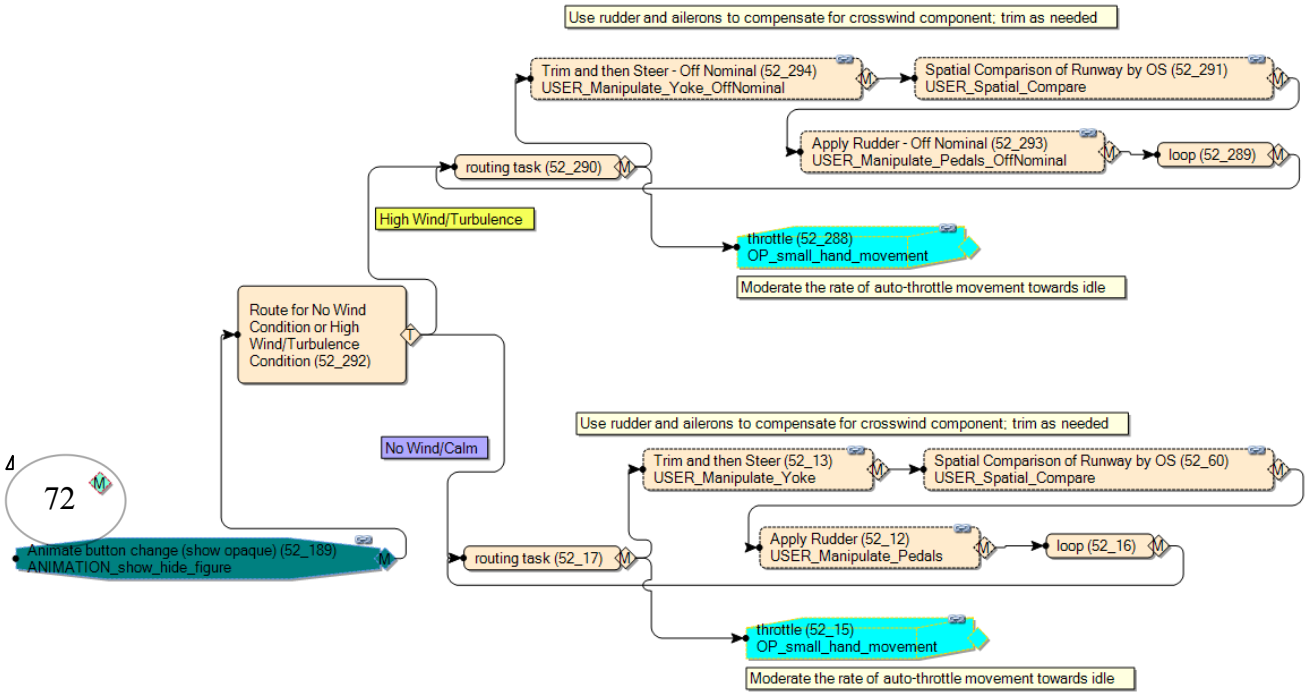


Figure 73. RNAV and CSPO 800 land phase of flight tasks under 650'.

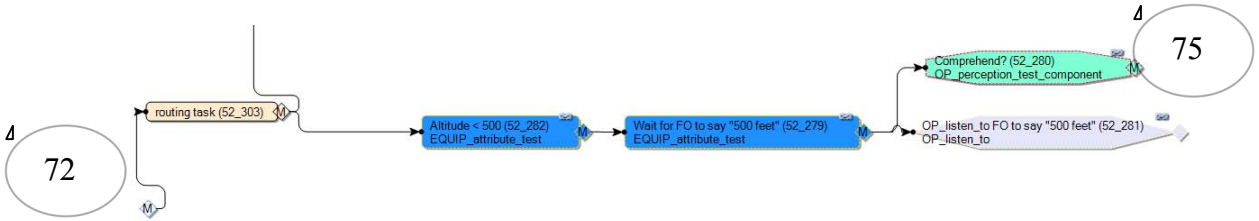


Figure 74. RNAV and CSPO 800 land phase of flight tasks under 650'.

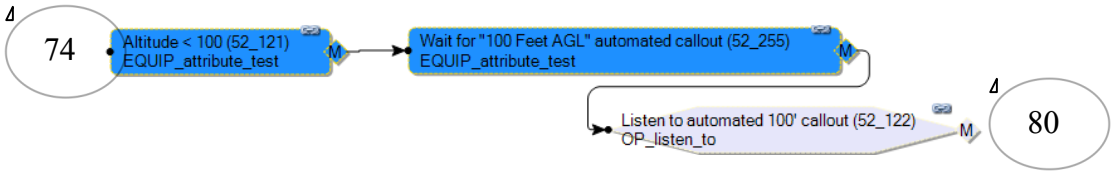


Figure 75. RNAV and CSPO 800 land phase of flight tasks under 100'.

The PF/CA's tasks for the VCSPA 200 scenario for the land phase of flight can be found in Figure 76 through Figure 82.

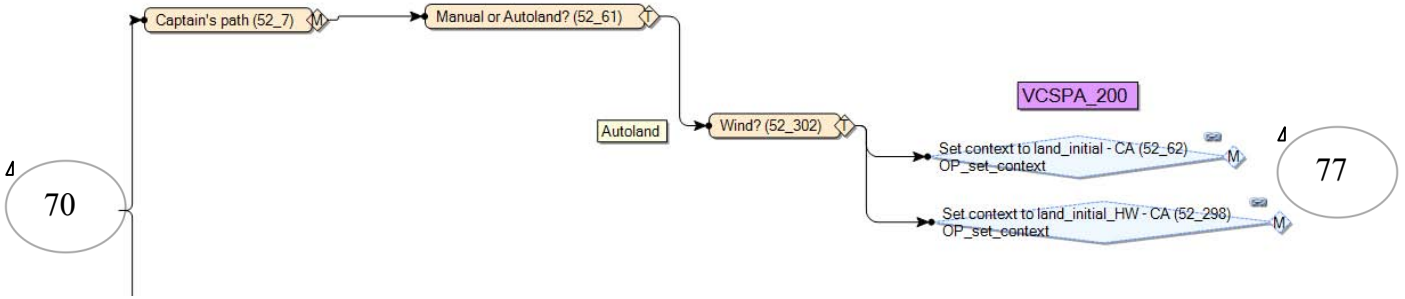


Figure 76. Context setting for the CSPO 200 condition.

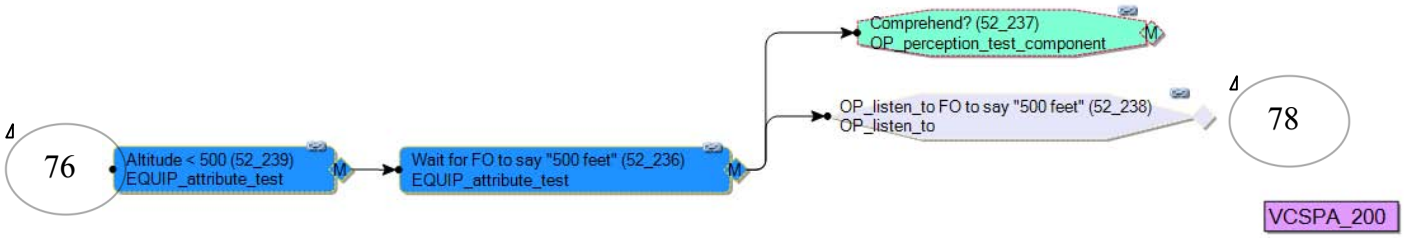


Figure 77. First set of actions required of the PF/CA at 500 ft.

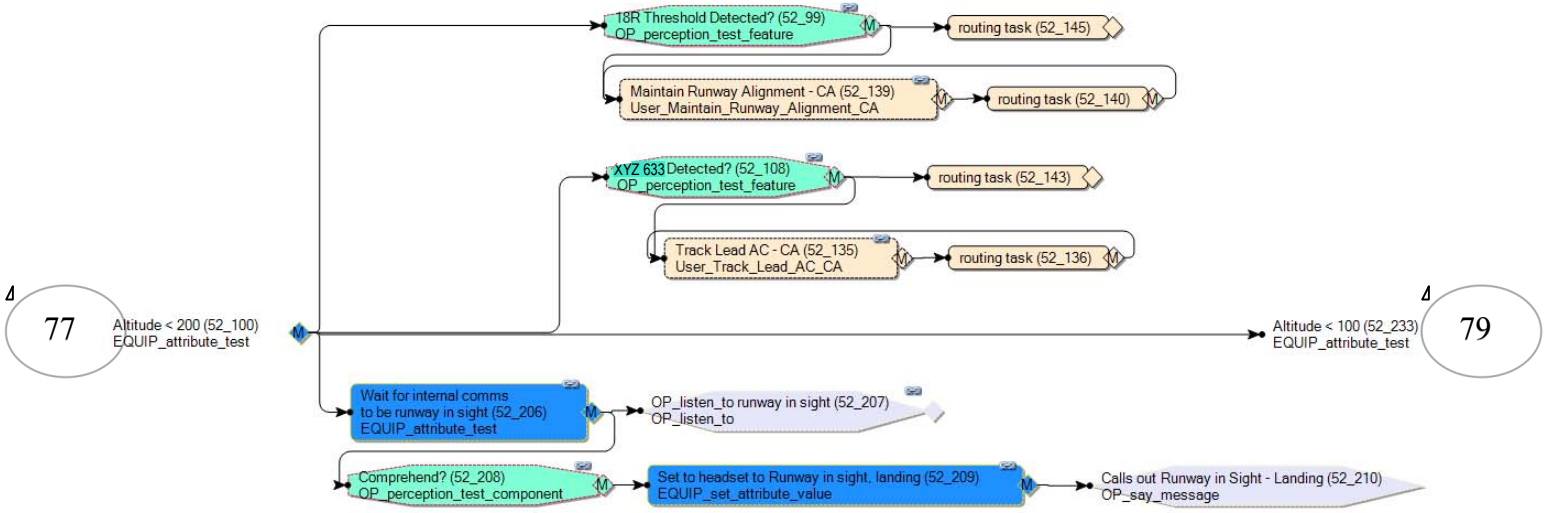


Figure 78. PF/CA runway alignment tasks under 200 ft.

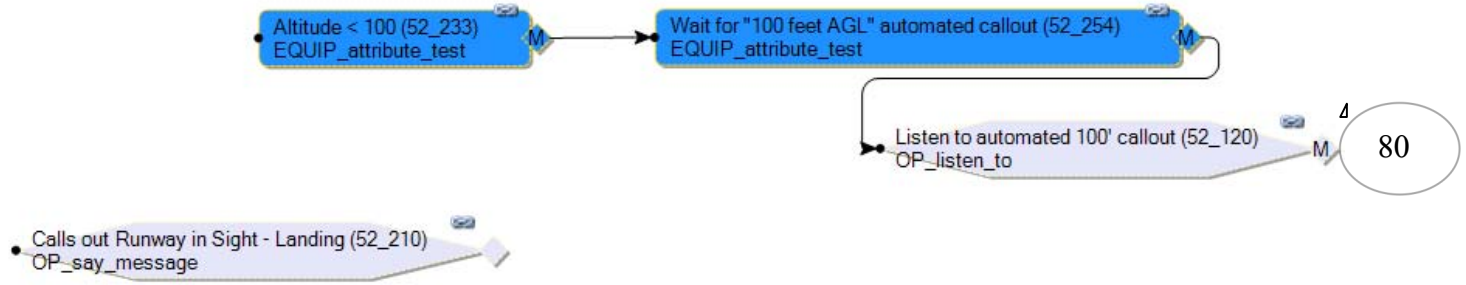


Figure 79. PF/CA tasks under 100 ft.

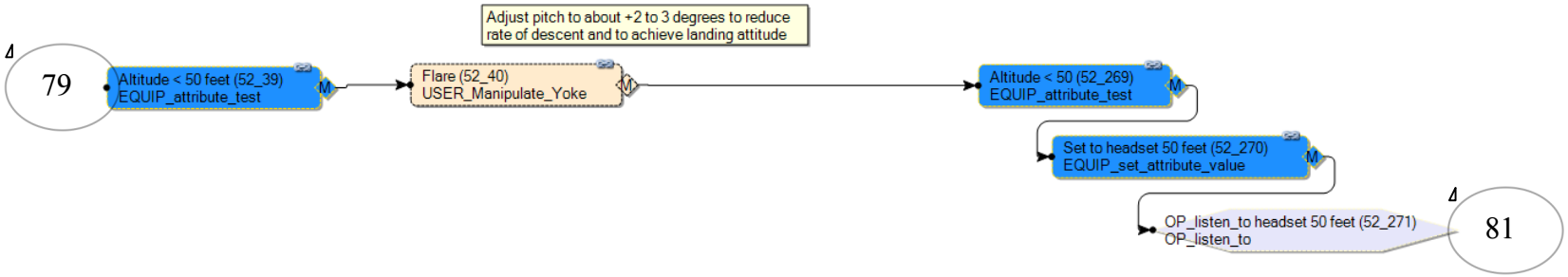


Figure 80. PF/CA Tasks under 50 ft.

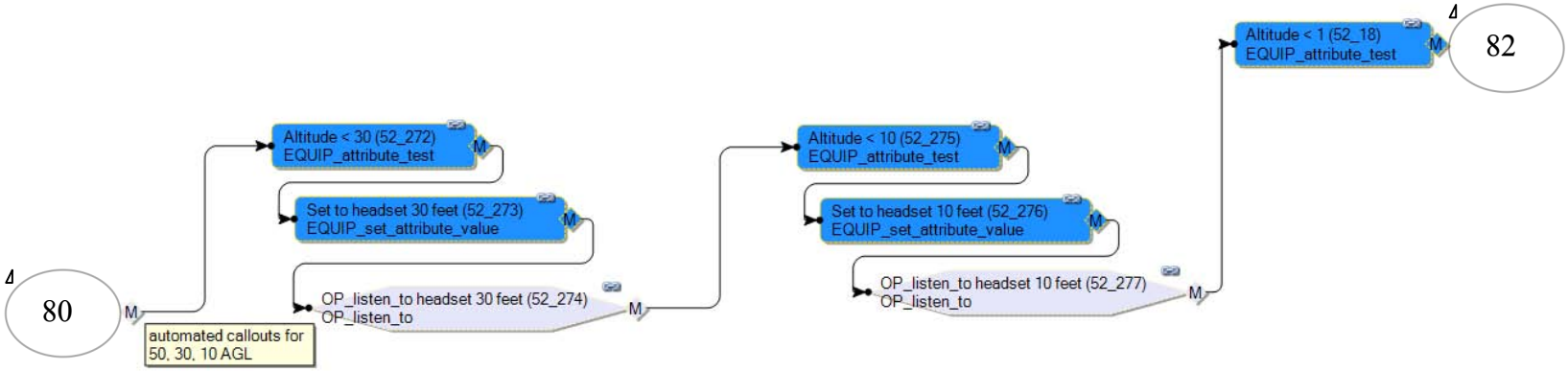


Figure 81. PF/CA auditory monitor of the automated call outs to TD.

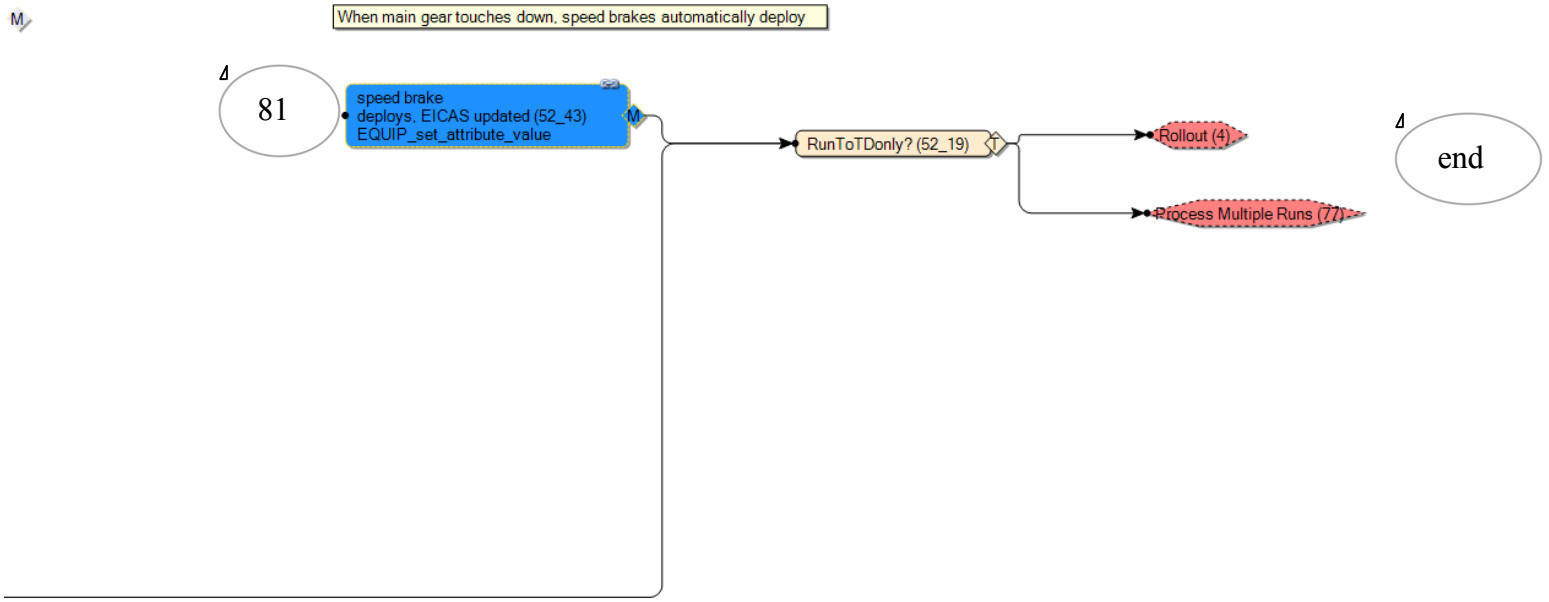


Figure 82. Settings to stop the simulation at touchdown.

The PNF/FO's tasks for the VCSPA 200 scenario for the land phase of flight can be found in Figure 83 through Figure 86.

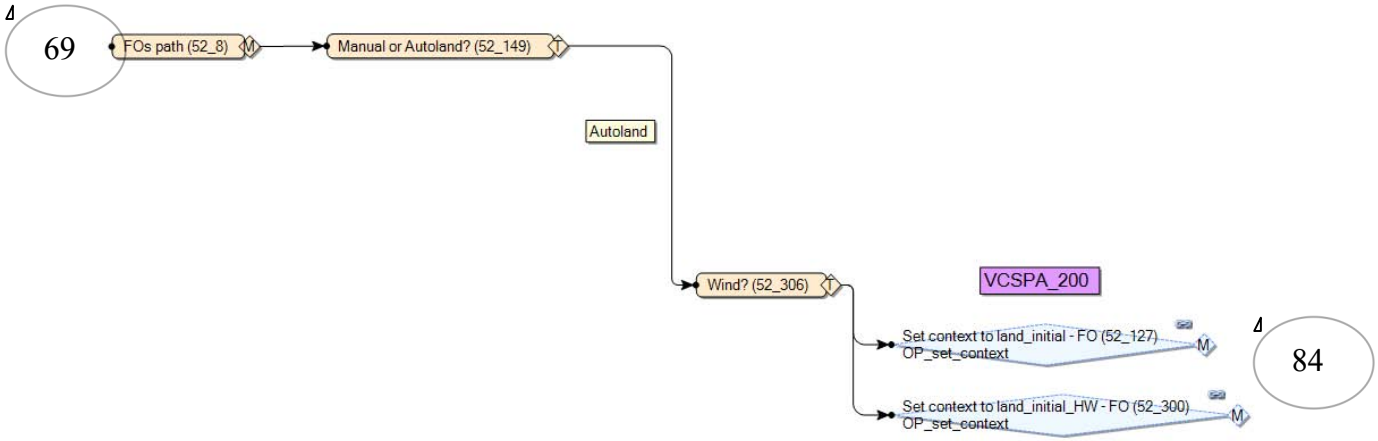


Figure 83. PNF/FO Context setting for the CSPO 200 condition.

Figure 84. First set of action required of the PNF/FO at 500 ft.

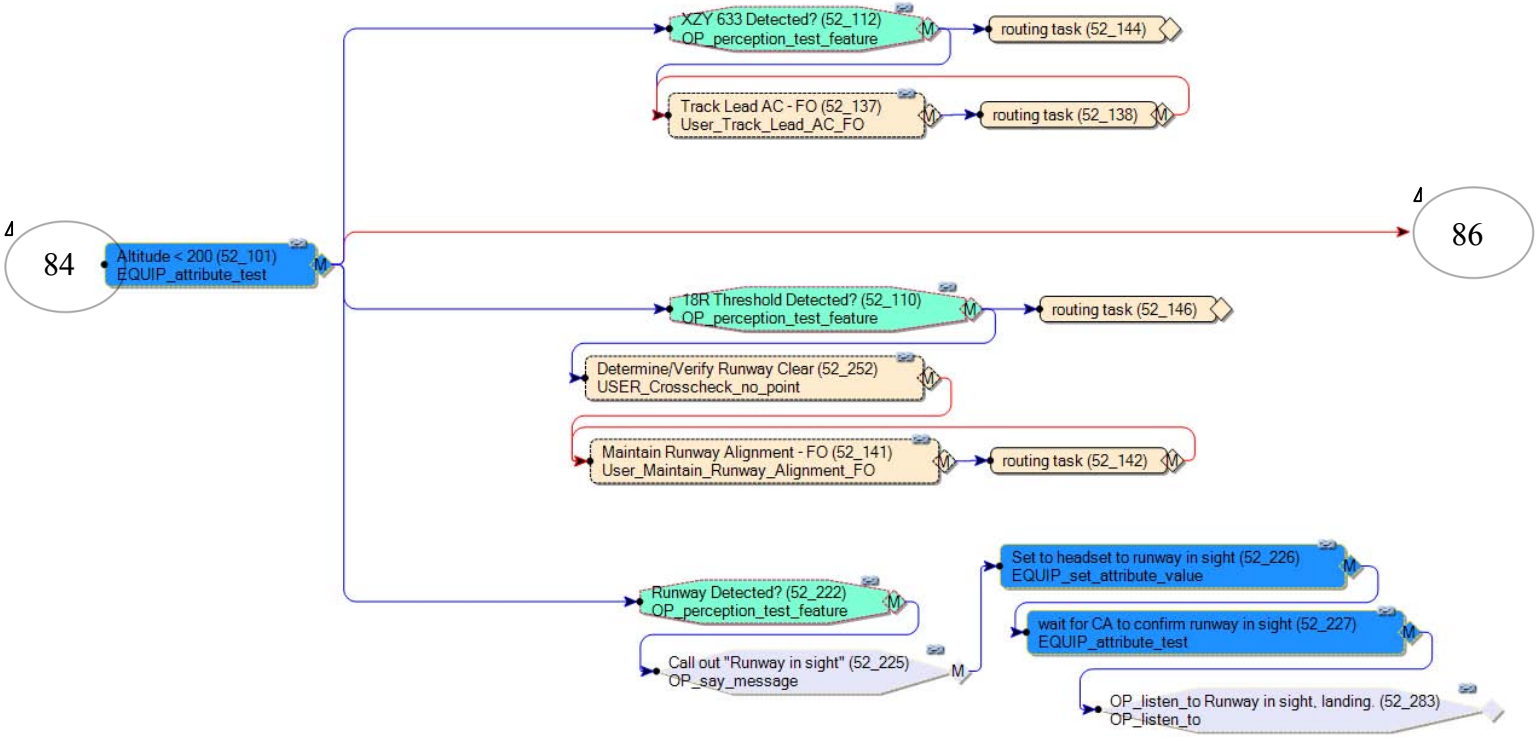


Figure 85. PNF/FO Runway alignment tasks under 200 ft.

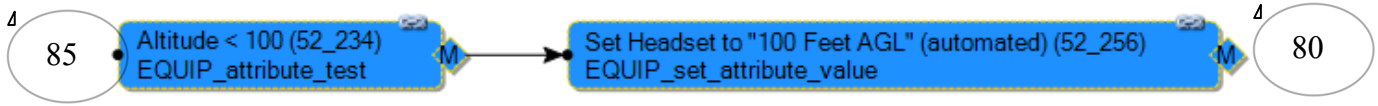


Figure 86. PNF/FO tasks under 100 ft.

This network then feeds back to the automated callouts tasks illustrated in Figure 80 and then to the rollout tasks (the next phase of flight not used in the current scenario) and the routing task “process multiple runs”.

Equipment Definitions in the Approach Scenario

The pieces of equipment within MIDAS need to be defined given the context that the aircraft is flying. As a result, a set of equipment definitions is generated through another task network and to which the operator tasks influences. This task network commanded the CAD visualization environment (Jack^{TM}) to display specific graphic representations according to the context of the task network model. The overall task network can be found in Figure 88.

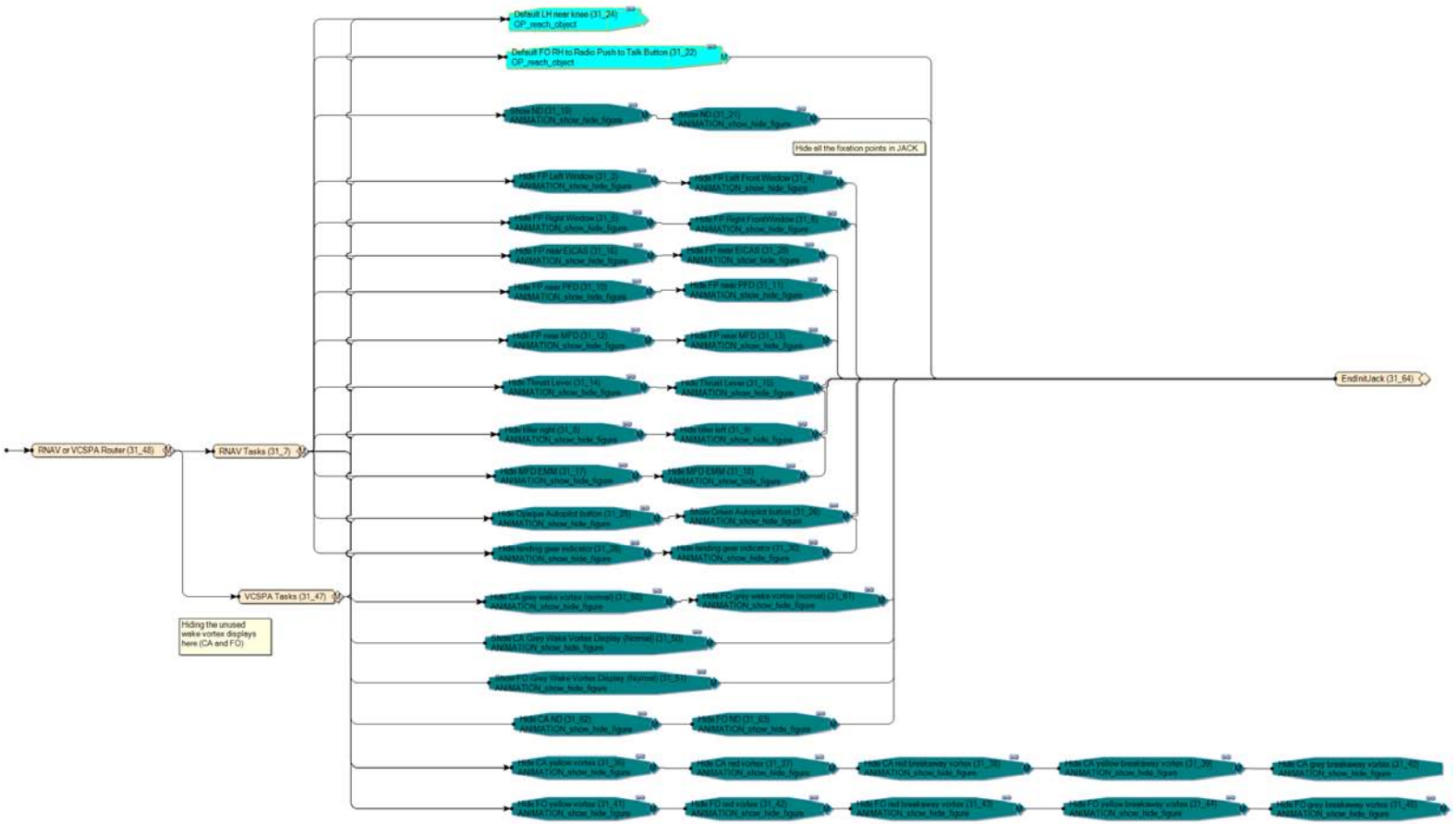


Figure 87. Task network settings of all of the pieces of equipment in the scenario modeled.

Figure 88 through Figure 92 increases the size of Figure 87 to make it more legible.

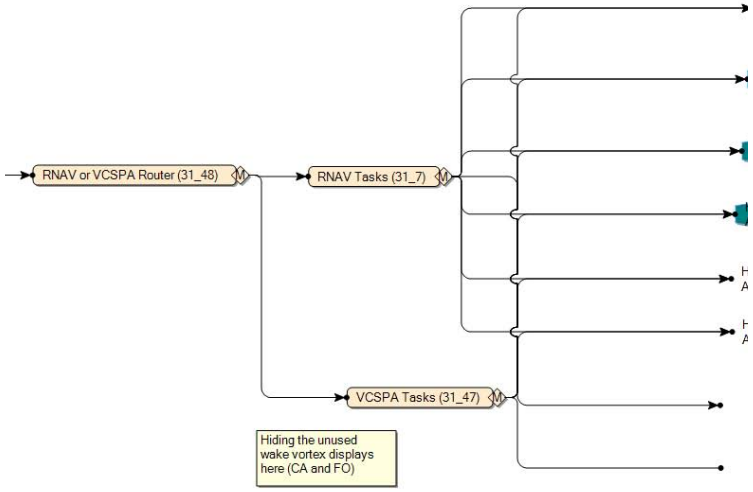


Figure 88. RNAV/CSPO routing tasks of the pieces of equipment in the scenario.

Figure 89. RNAV/CSPO equipment (Nav, Window, EICAS, and PFD) CAD and Jack definitions in the scenario.

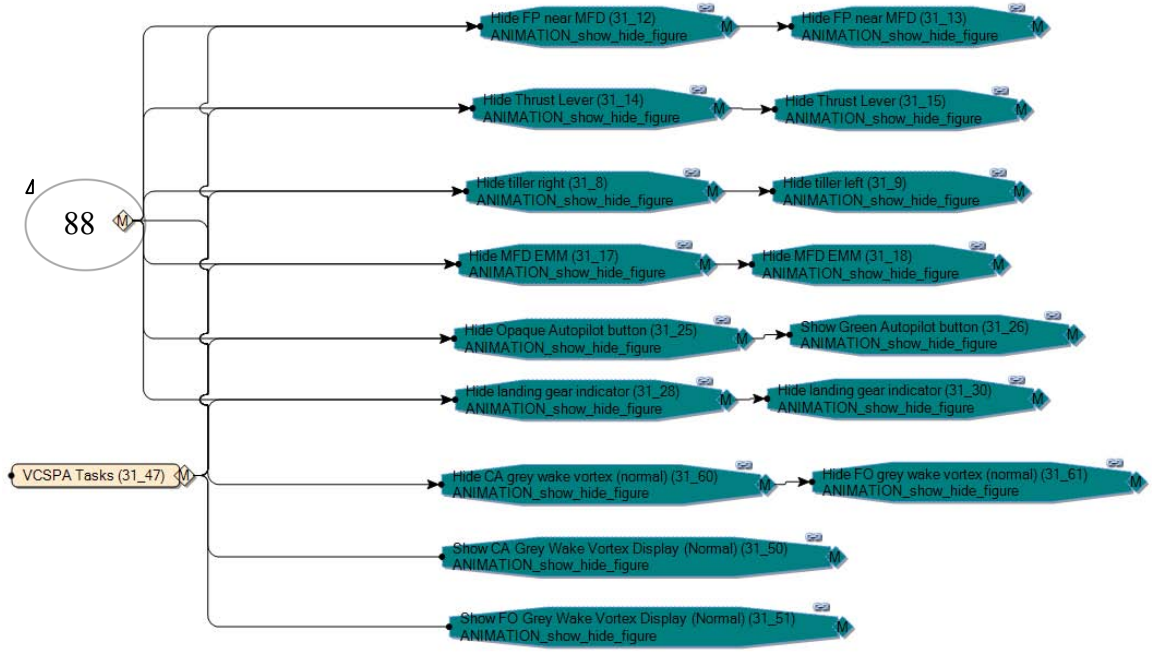


Figure 90. RNAV/CSPO equipment (MFD, Thrust, Tiller, Autopilot,- gear, Wake display) CAD and Jack definitions in the scenario.

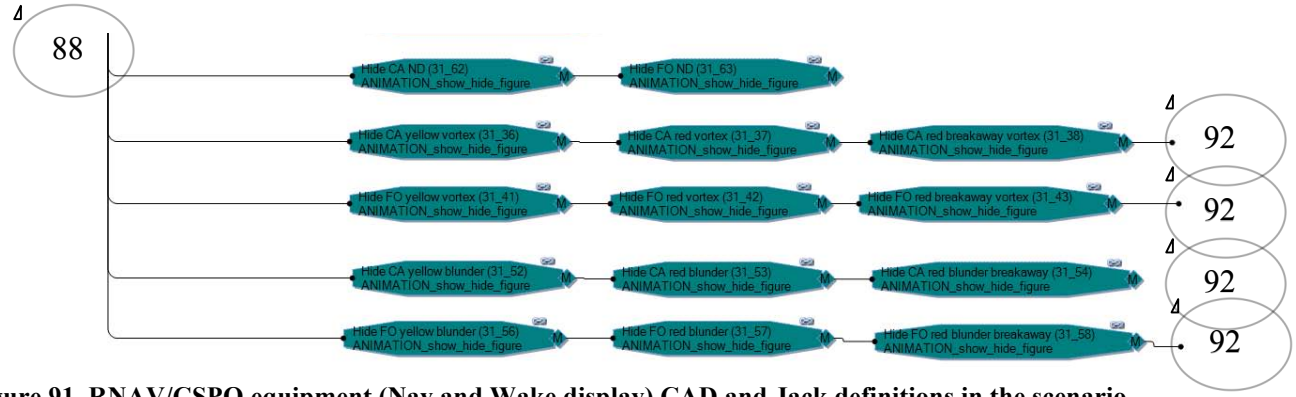


Figure 91. RNAV/CSPO equipment (Nav and Wake display) CAD and Jack definitions in the scenario.

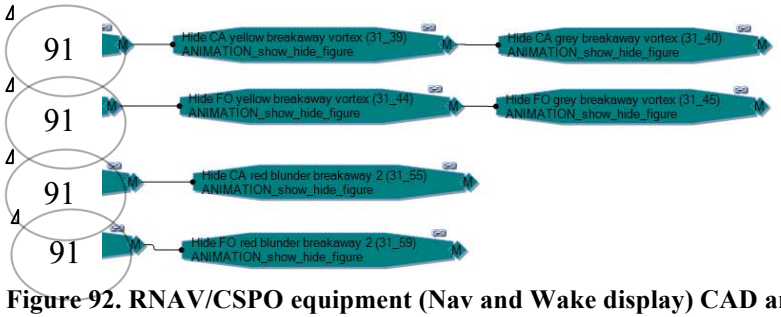


Figure 92. RNAV/CSPO equipment (Nav and Wake display) CAD and Jack definitions in the scenario.

Once all jack variables are initialized, the task network needs to be stopped (31_64) (see Figure 93).

Figure 93. Stopping the equipment (Nav and Wake display) CAD and Jack definition task networks.

First officer Probes and Alerts

At the onset of a red aircraft blunder alert, the pilot immediately presses the TOGA (Take-off and go around) button on the thrust lever. This action in current-day RNAV scenarios automatically puts the aircraft into a ground track mode to level the wings, pitch the aircraft up and apply thrust as to make the aircraft climb quickly. These actions are simulated in the model for both RNAV and VCSPA-type approaches. In the VCSPA approach only, however, the TOGA button press by the pilot automatically switches the Nav display (Jack cockpit model) to highlight a breakaway track that the pilot must follow to take the aircraft out of the wake vortex or blunder situation. While the pilots deal with this off-nominal alert, they are concurrently processing information about the state of their aircraft, e.g. the RNP displayed on the EICAS. As illustrated in Figure 94, 3 RNP alerts occurred in the land and divert scenario. It can be seen in the figure that pilot must detect the RNP alert on the upper EICAS and then comprehend this information in order to execute a successful landing.

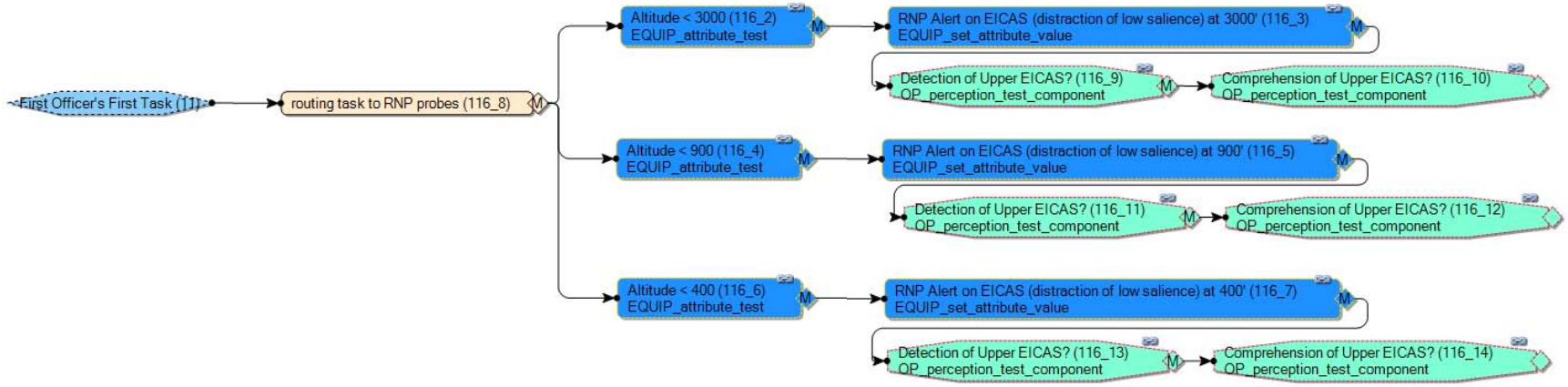


Figure 94. Task network of RNP probe alert.

External Environment Features Definitions

The initial features of the external environment (features drive the external vision/perception model) are illustrated in Figure 95. These initial definitions specify the starting conditions for the external features that are then influenced by the environmental triggers that then feed into the behavior model of MIDAS.

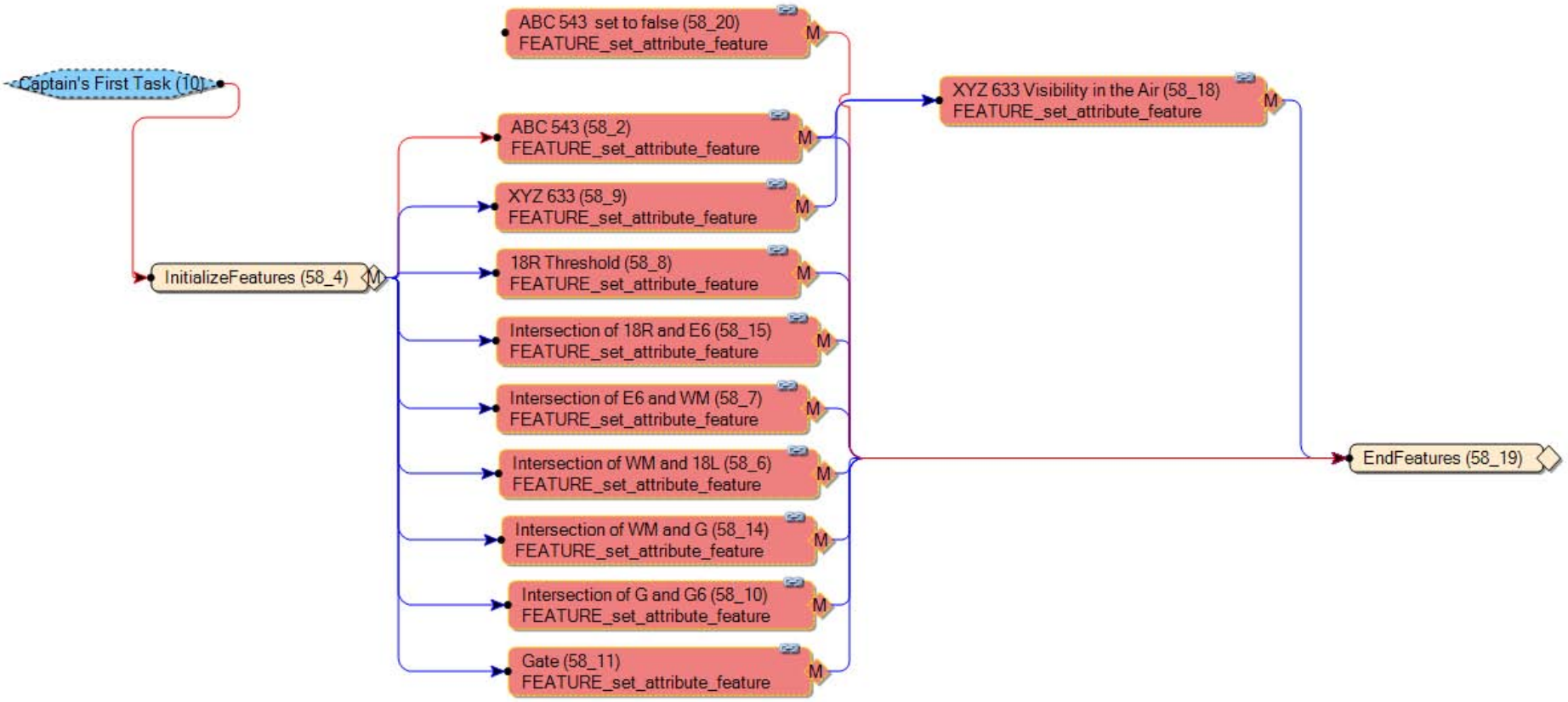
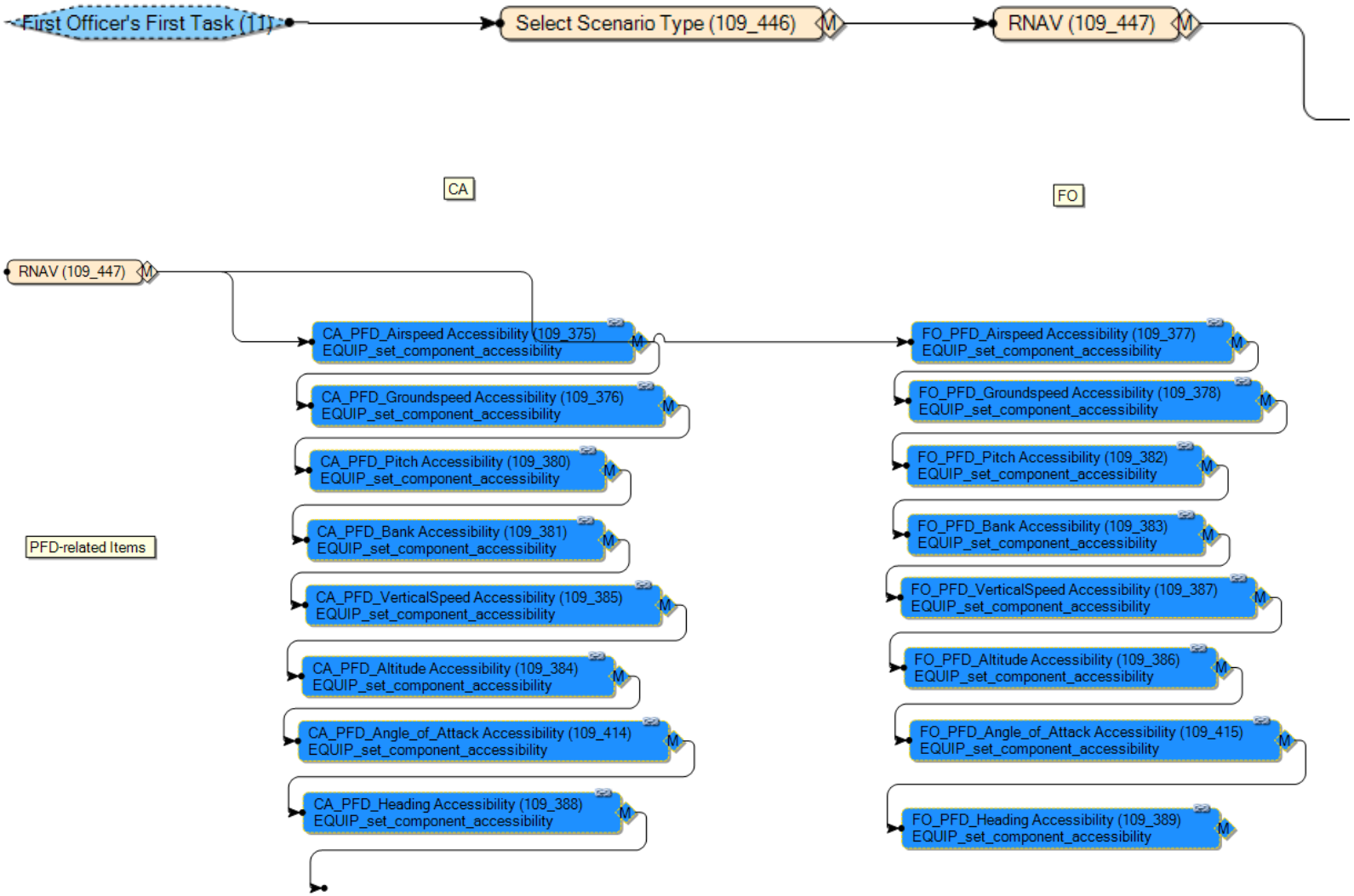


Figure 95. Initial feature definitions of the environment.

Accessibility Definitions

The accessibility of information is required for each context in the simulation. As such, the initialize accessibilities definitions for the PF/CA and the PNF/FO in the RNAV are illustrated in Figure 96 (broken across the next three pages), while the initialize accessibilities definitions for the PF/CA and PNF/FO in the CSPO condition are illustrated in Figure 97.


First Officer's First Task (11)
Select Scenario Type (109_446)
RNAV (109_447)
CA
FO
RNAV (109_447)
PFD-related Items
CA_PFD_Airspeed Accessibility (109_375) EQUIP_set_component_accessibility
CA_PFD_Groundspeed Accessibility (109_376) EQUIP_set_component_accessibility
CA_PFD_Pitch Accessibility (109_380) EQUIP_set_component_accessibility
CA_PFD_Bank Accessibility (109_381) EQUIP_set_component_accessibility
CA_PFD_VerticalSpeed Accessibility (109_385) EQUIP_set_component_accessibility
CA_PFD_Altitude Accessibility (109_384) EQUIP_set_component_accessibility
CA_PFD_Angle_of_Attack Accessibility (109_414) EQUIP_set_component_accessibility
CA_PFD_Heading Accessibility (109_388) EQUIP_set_component_accessibility
FO_PFD_Airspeed Accessibility (109_377) EQUIP_set_component_accessibility
FO_PFD_Groundspeed Accessibility (109_378) EQUIP_set_component_accessibility
FO_PFD_Pitch Accessibility (109_382) EQUIP_set_component_accessibility
FO_PFD_Bank Accessibility (109_383) EQUIP_set_component_accessibility
FO_PFD_VerticalSpeed Accessibility (109_387) EQUIP_set_component_accessibility
FO_PFD_Altitude Accessibility (109_386) EQUIP_set_component_accessibility
FO_PFD_Angle_of_Attack Accessibility (109_415) EQUIP_set_component_accessibility
FO_PFD_Heading Accessibility (109_389) EQUIP_set_component_accessibility


NAV-related Items
CA_PFD_Wake Accessibility (109_512)
EQUIP_set_component_accessibility
CA_PFD_Virtual 4D Accessibility (109_540)
EQUIP_set_component_accessibility
CA_NAV_MFD_Heading Accessibility (109_390)
EQUIP_set_component_accessibility
CA_NAV_MFD_Route Accessibility (109_392)
EQUIP_set_component_accessibility
CA_NAV_MFD_BreakoutRoute Accessibility (109_396)
EQUIP_set_component_accessibility
CA_NAV_MFD_Traffic Accessibility (109_400)
EQUIP_set_component_accessibility
CA_NAV_MFD_Weather Accessibility (109_408)
EQUIP_set_component_accessibility
CA_NAV_MFD_Terrain Accessibility (109_404)
EQUIP_set_component_accessibility
CA_NAV_Wake Accessibility (109_515)
EQUIP_set_component_accessibility
FO_PFD_Wake Accessibility (109_513)
EQUIP_set_component_accessibility
FO_PFD_Virtual 4D Accessibility (109_541)
EQUIP_set_component_accessibility
FO_NAV_MFD_Heading Accessibility (109_391)
EQUIP_set_component_accessibility
FO_NAV_MFD_Route Accessibility (109_393)
EQUIP_set_component_accessibility
FO_NAV_MFD_BreakoutRoute Accessibility (109_397)
EQUIP_set_component_accessibility
FO_NAV_MFD_Traffic Accessibility (109_401)
EQUIP_set_component_accessibility
FO_NAV_MFD_Weather Accessibility (109_409)
EQUIP_set_component_accessibility
FO_NAV_MFD_Terrain Accessibility (109_405)
EQUIP_set_component_accessibility
FO_NAV_Wake Accessibility (109_516)
EQUIP_set_component_accessibility

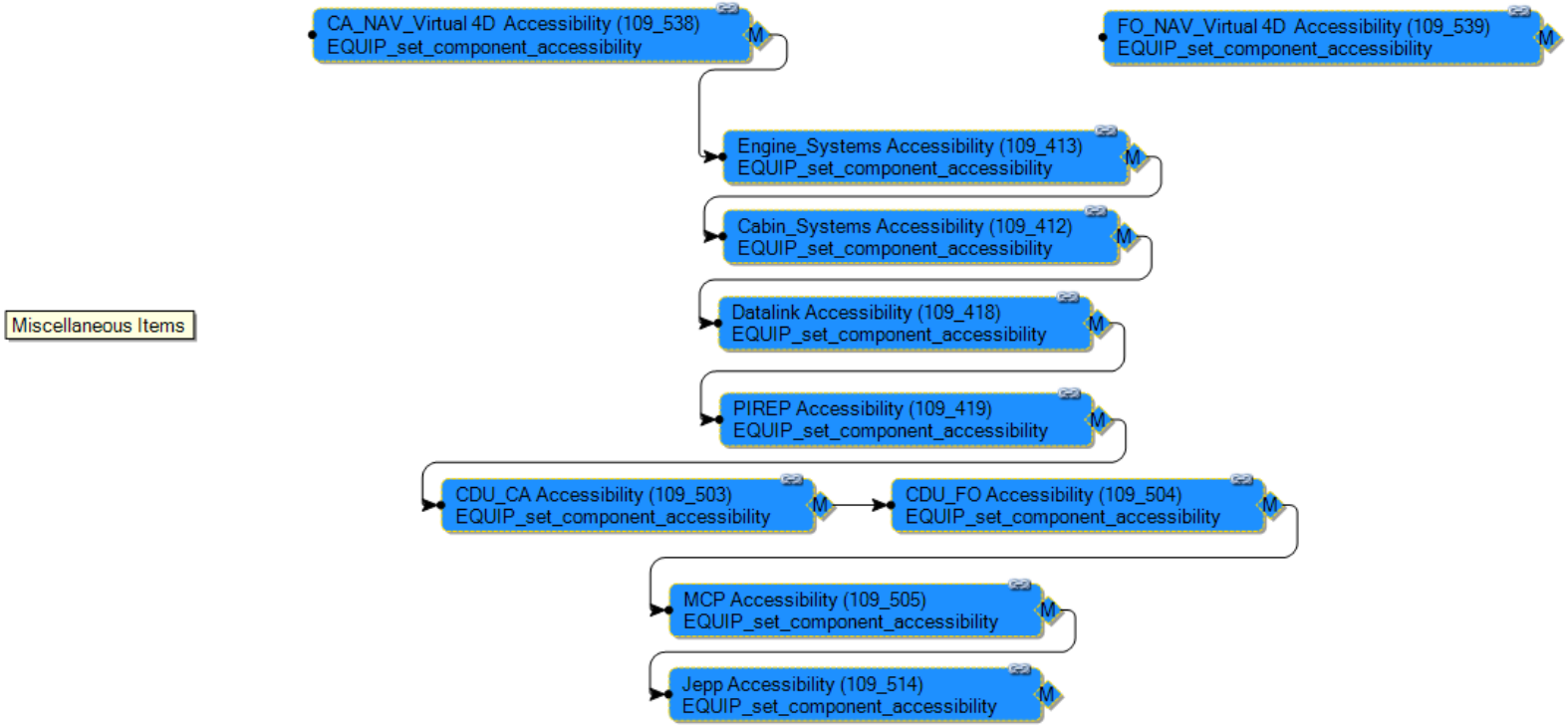
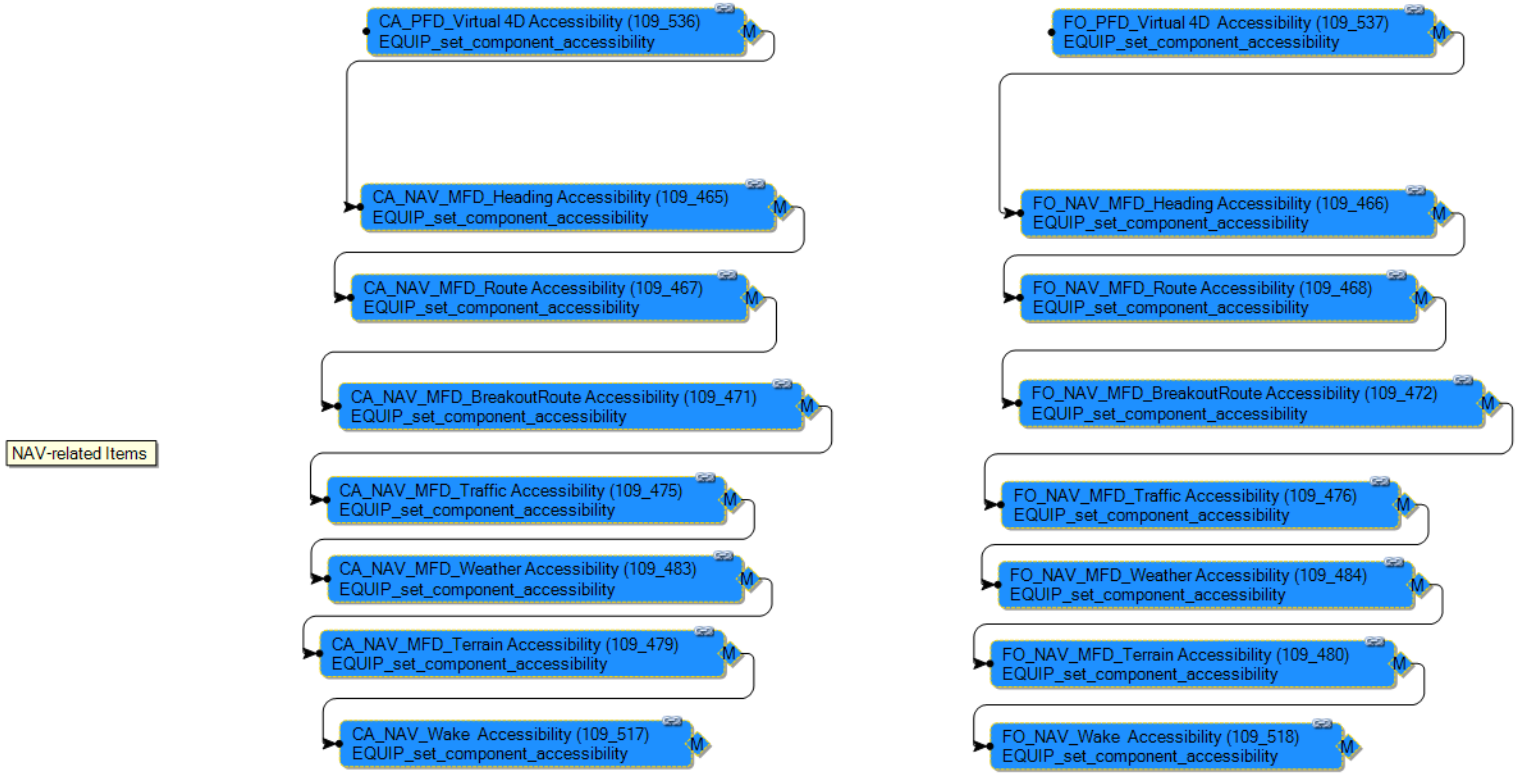


Figure 96. PF/CA and PNF/FO routing task for setting the context to drive the RNAV information accessibility.


CA
FO
Scenario: VCSPA
VCSPA (109_448)
PFD-related Items
CA_PFD_Airspeed Accessibility (109_451) EQUIP_set_component_accessibility
CA_PFD_Groundspeed Accessibility (109_452) EQUIP_set_component_accessibility
CA_PFD_Pitch Accessibility (109_455) EQUIP_set_component_accessibility
CA_PFD_Bank Accessibility (109_456) EQUIP_set_component_accessibility
CA_PFD_VerticalSpeed Accessibility (109_460) EQUIP_set_component_accessibility
CA_PFD_Altitude Accessibility (109_459) EQUIP_set_component_accessibility
CA_PFD_Angle_of_Attack Accessibility (109_489) EQUIP_set_component_accessibility
CA_PFD_Heading Accessibility (109_463) EQUIP_set_component_accessibility
CA_PFD_Wake Accessibility (109_519) EQUIP_set_component_accessibility
FO_PFD_Airspeed Accessibility (109_453) EQUIP_set_component_accessibility
FO_PFD_Groundspeed Accessibility (109_454) EQUIP_set_component_accessibility
FO_PFD_Pitch Accessibility (109_457) EQUIP_set_component_accessibility
FO_PFD_Bank Accessibility (109_458) EQUIP_set_component_accessibility
FO_PFD_VerticalSpeed Accessibility (109_462) EQUIP_set_component_accessibility
FO_PFD_Altitude Accessibility (109_461) EQUIP_set_component_accessibility
FO_PFD_Angle_of_Attack Accessibility (109_490) EQUIP_set_component_accessibility
FO_PFD_Heading Accessibility (109_464) EQUIP_set_component_accessibility
FO_PFD_Wake Accessibility (109_520) EQUIP_set_component_accessibility


NAV-related Items
CA_PFD_Virtual 4D Accessibility (109_536)
EQUIP_set_component_accessibility
CA_NAV_MFD_Heading Accessibility (109_465)
EQUIP_set_component_accessibility
CA_NAV_MFD_Route Accessibility (109_467)
EQUIP_set_component_accessibility
CA_NAV_MFD_BreakoutRoute Accessibility (109_471)
EQUIP_set_component_accessibility
CA_NAV_MFD_Traffic Accessibility (109_475)
EQUIP_set_component_accessibility
CA_NAV_MFD_Weather Accessibility (109_483)
EQUIP_set_component_accessibility
CA_NAV_MFD_Terrain Accessibility (109_479)
EQUIP_set_component_accessibility
CA_NAV_Wake Accessibility (109_517)
EQUIP_set_component_accessibility
FO_PFD_Virtual 4D Accessibility (109_537)
EQUIP_set_component_accessibility
FO_NAV_MFD_Heading Accessibility (109_466)
EQUIP_set_component_accessibility
FO_NAV_MFD_Route Accessibility (109_468)
EQUIP_set_component_accessibility
FO_NAV_MFD_BreakoutRoute Accessibility (109_472)
EQUIP_set_component_accessibility
FO_NAV_MFD_Traffic Accessibility (109_476)
EQUIP_set_component_accessibility
FO_NAV_MFD_Weather Accessibility (109_484)
EQUIP_set_component_accessibility
FO_NAV_MFD_Terrain Accessibility (109_480)
EQUIP_set_component_accessibility
FO_NAV_Wake Accessibility (109_518)
EQUIP_set_component_accessibility

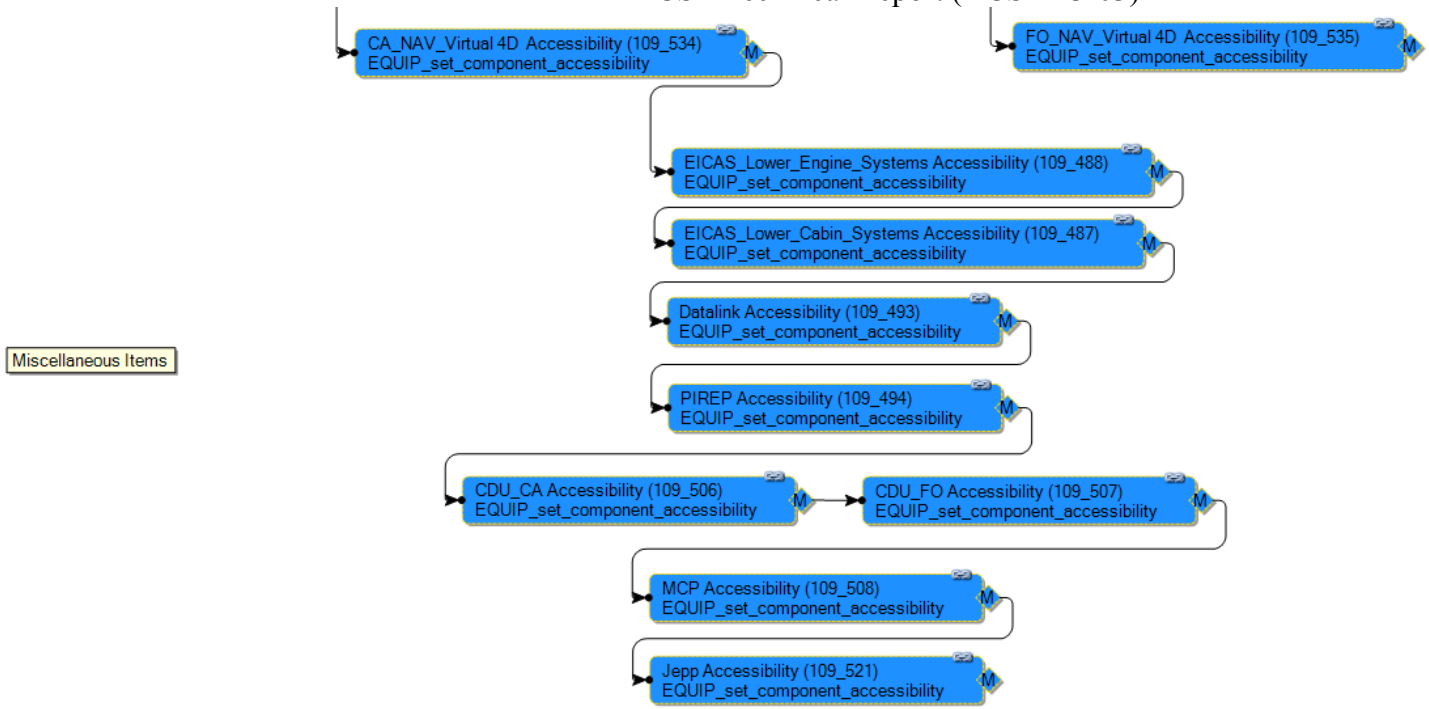


Figure 97. PF/CA and PNF/FO routing task for setting the context to drive the CSPO information accessibility.

Set 4D State Definitions

All initial 4D states need to be defined at the outset of the model's run. Figure 98 shows the initial 4D state definitions on the PF/CA and PNF/FO's NAV and PFD.

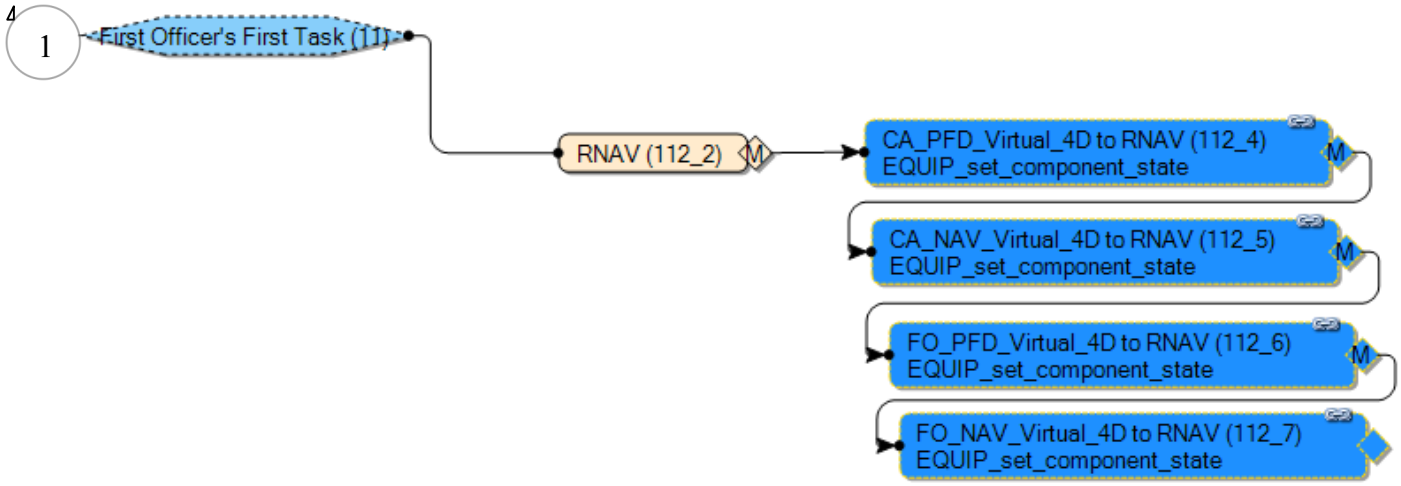


Figure 98. Initial RNAV 4D component model state definitions.

Set Wake States Definitions

All initial wake display states need to be defined at the outset of the model's run. Figure 99 shows the initial wake state definitions.

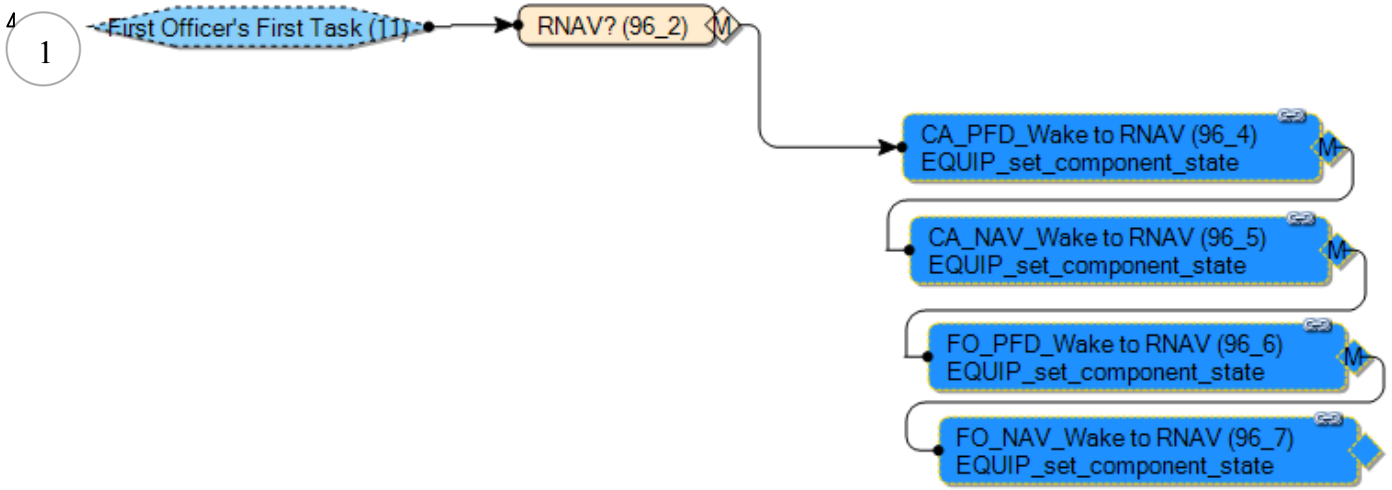
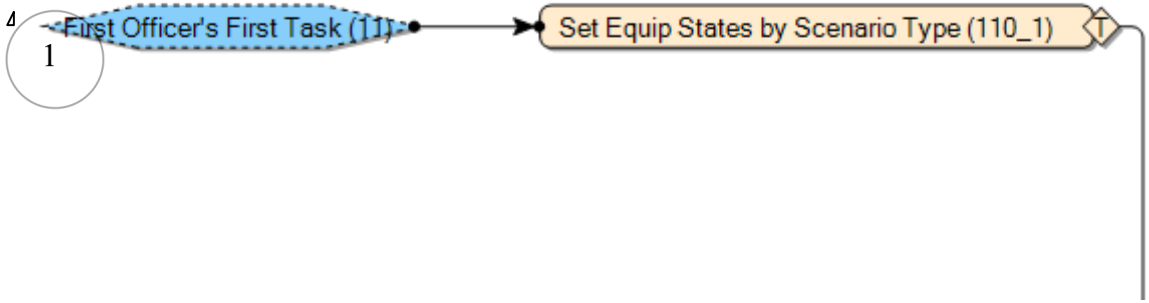
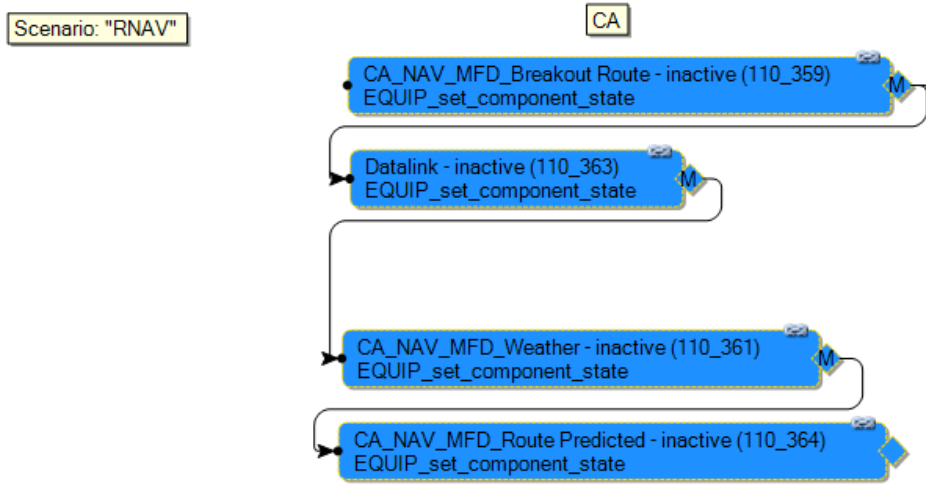


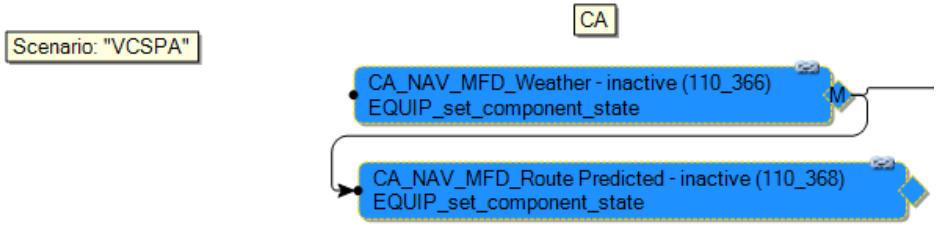
Figure 99. Initial wake state definitions.

Set Equipment by Scenario

The state of each piece of equipment is defined according to the scenario that is being modeled, either RNAV or CSPO. Each of the RNAV or CSPO scenarios will have different pieces of information on the equipment components and as such need to be defined separately. Creating this logic allows flags to be turned on and off and allows for the most consistent use of the model between conditions. Figure 100 illustrates the paths and the initial scenario definitions for the equipment components.




Scenario: "RNAV"
CA
CA_NAV_MFD_Breakout Route - inactive (110_359)
EQUIP_set_component_state
M
Datalink - inactive (110_363)
EQUIP_set_component_state
M
CA_NAV_MFD_Weather - inactive (110_361)
EQUIP_set_component_state
M
CA_NAV_MFD_Route Predicted - inactive (110_364)
EQUIP_set_component_state


Scenario: "VCSPA"
CA
CA_NAV_MFD_Weather - inactive (110_366)
EQUIP_set_component_state
M
CA_NAV_MFD_Route Predicted - inactive (110_368)
EQUIP_set_component_state

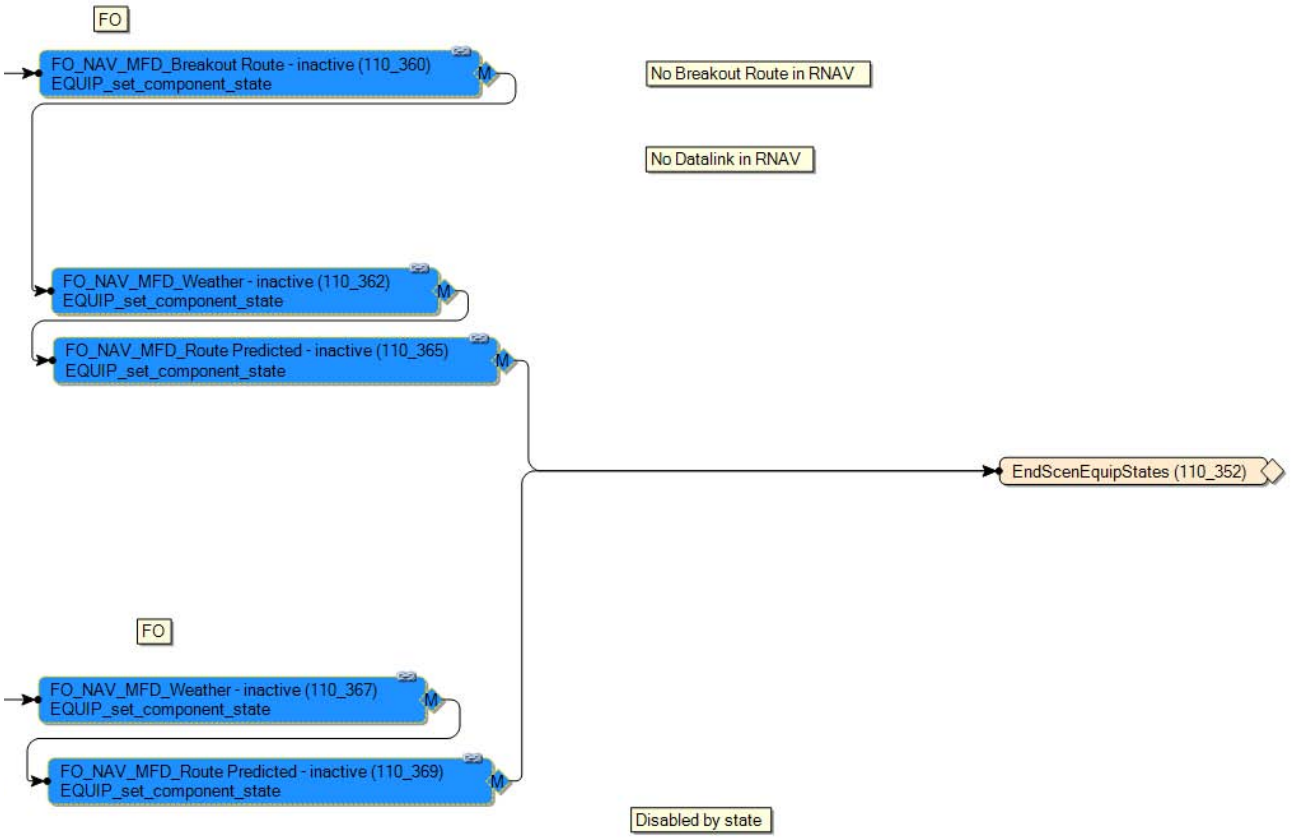


Figure 100. Equipment component initial settings.

Decoupling Event

The decoupling event was an event used to represent a typical off nominal event when flying CSPO-like approaches as identified through SME evaluations (Gore, Hooey, Wickens, Sebok, Hutchins, Salud, Small, Koenecke, & Bzostek, 2009). The decoupling event occurred on the upper EICAS. Three altitudes (1000 ft, 700 ft, and 500 ft) were used to evaluate the impact in terms of response time and workload of such an off-nominal occurrence when on approach. The MicroSaint Sharp model that sent this information to MIDAS can be found in Figure 101, while the MIDAS procedures used in response to this environmental event for the Captain can be located in Figure 102 through Figure 104, while the PNF/FO task set can be located in Figure 105 and Figure 106.

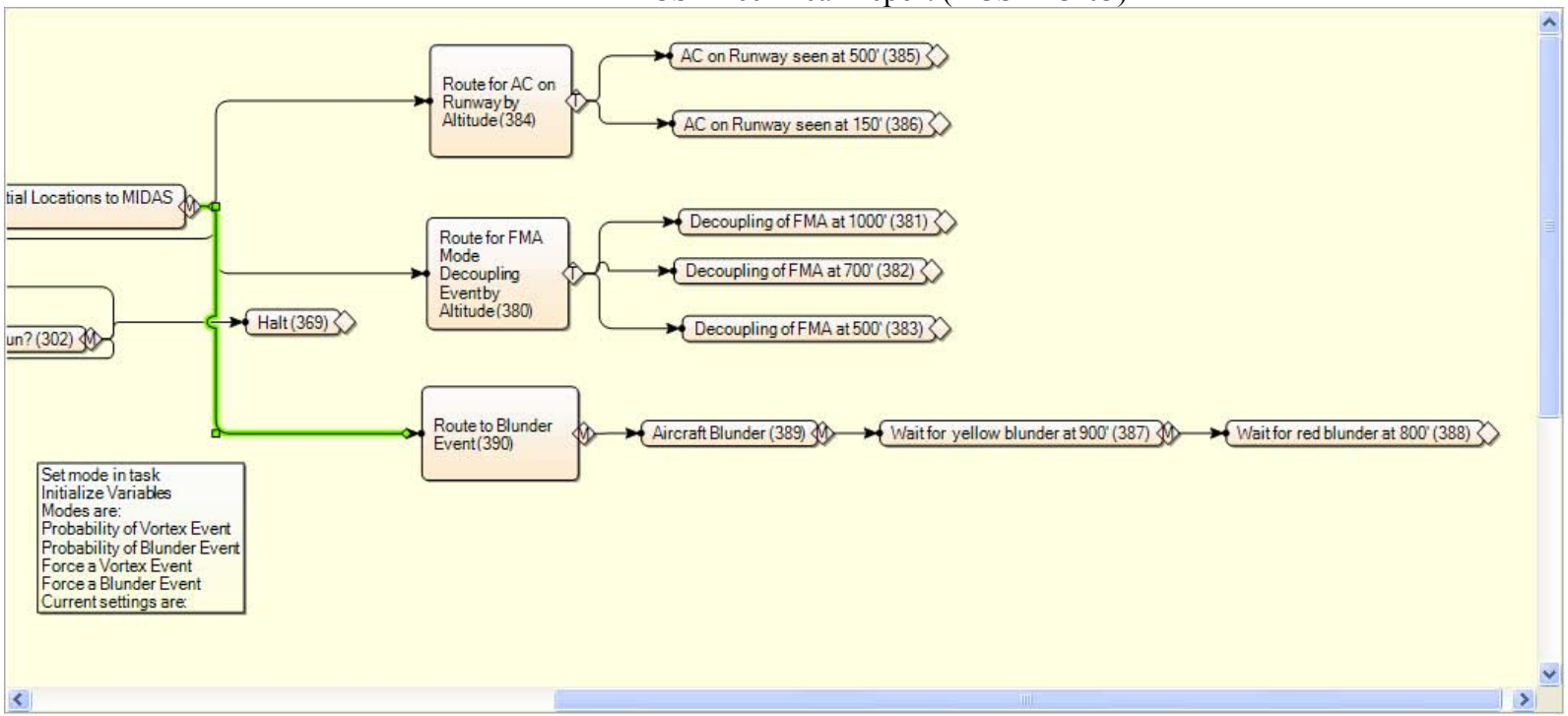


Figure 101. MicroSaint Sharp Model that sends aircraft decoupling event to MIDAS.

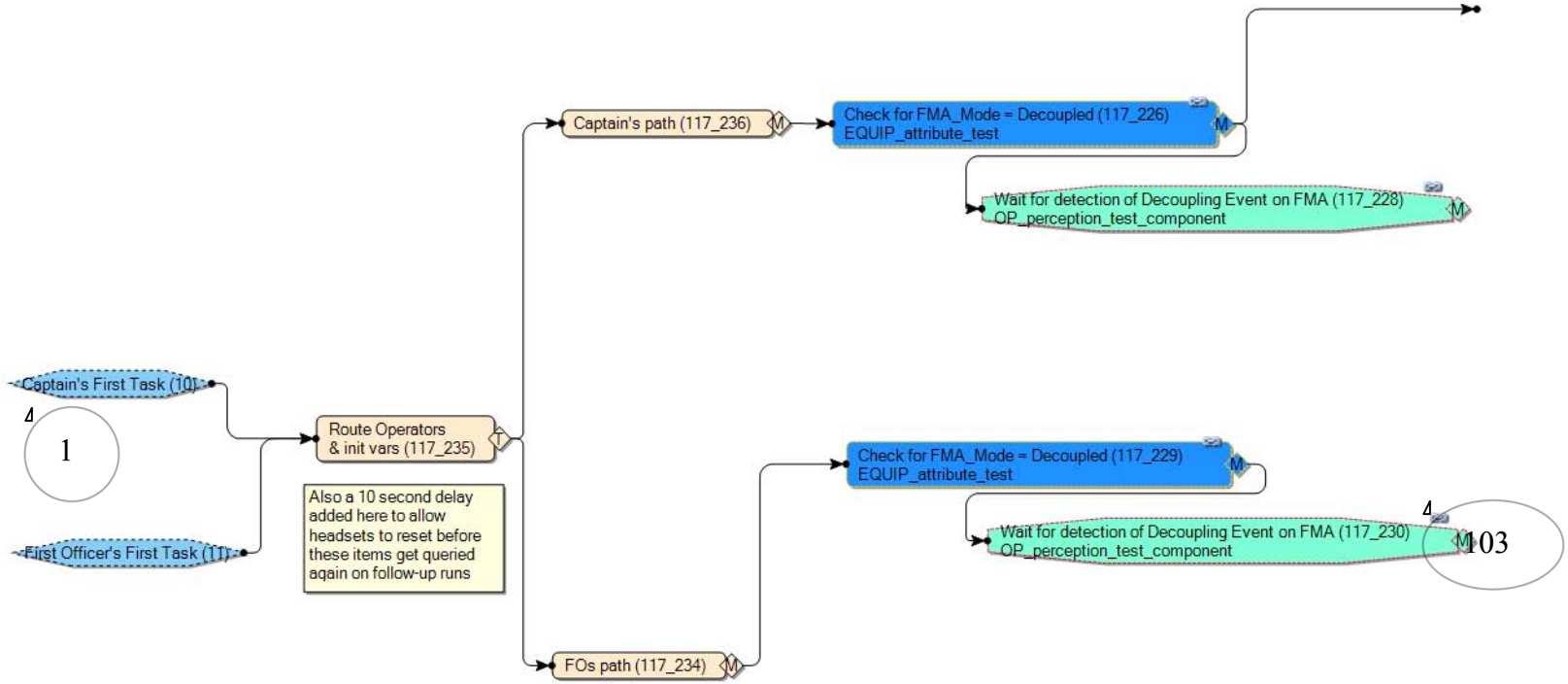


Figure 102. MIDAS PF/CA and PNF/FO response to decoupling event.

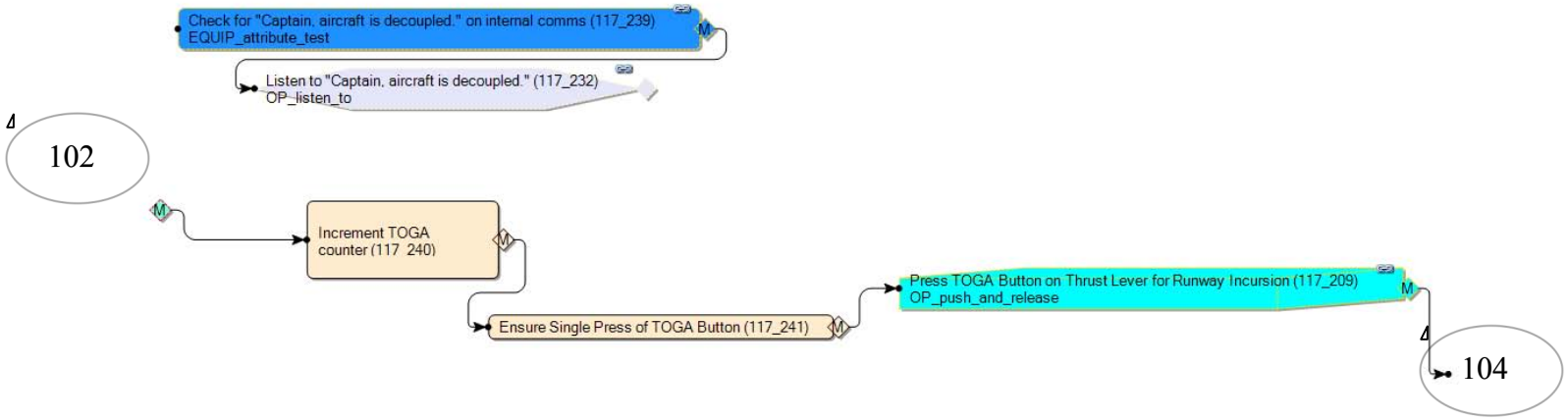


Figure 103. MIDAS PF/CA status checks for aircraft decoupling.

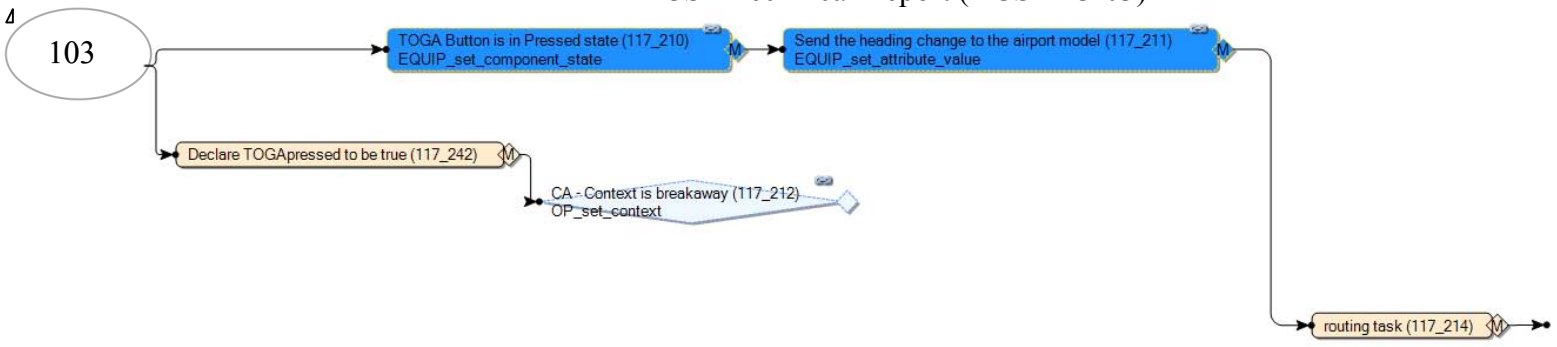


Figure 104. MIDAS PF/CA response to decoupling event.

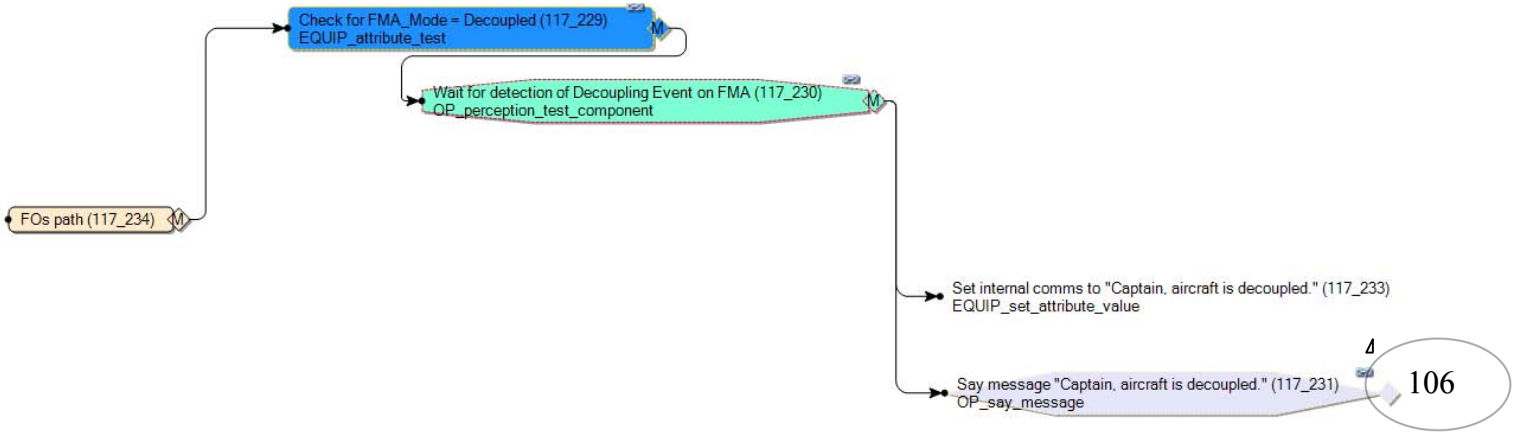


Figure 105. MIDAS PNF/FO status checks for aircraft decoupling (occurs concurrently with Figure 103).

Figure 106. MIDAS PNF/FO response to aircraft decoupling.

Wake Vortex Attention Settings

The network entitled wake vortex settings was used to define the operator responses to the wake vortex event in two conditions. Each pilot's NAV DISPLAY (HIGH ACCESSIBILITY) shows route, lead aircraft, and wake. The Nav display indicates blunder and wake threats with three alert modes – nominal (white), yellow alert, and red alert. During the 'yellow alert' phase, pilots loop through a 4-step sequence to prepare for an eventual missed approach if the alert turns red: 1. **Detect Alert; 2. Assess Situation; 3. Determine Missed Approach response; 4. Communicate Missed Approach Response**.

Defining the Detect-Assess –Determine Response – Communicate sequence:

1. One pilot must **Detect** the presence of the yellow / red alert and notify the other pilot.
2. Both pilots then must **Assess the Situation.** This requires they **comprehend** the information on the Situational Elements: ND- Wake, OTW Front Left. Pilots then confirm that the ND and OTW are consistent.
3. Next both pilots must **'Determine Missed Approach response'** or, in other words decide what action will be required in the event that the yellow alert turns to red (5 +/- 2 seconds.)
4. Then the pilots **communicate** this Missed Approach plan within the cockpit. This entails a verbal communication between the captain and FO.

Defining pilot actions in response to alert states:

If the display is yellow, this signifies that the lead aircraft or its wake may transgress into the flight path of the following aircraft. As a result, the flight deck will need to continually assess the behavior of this aircraft through a loop that Assesses the Situation - Determines the MA response - and Communicates the positional information/status. If the wake display is red, AND the missed approach plan has been communicated in the last 5 seconds, the pilots execute the MA plan by pressing the TOGA (Take-off and go around) button on the thrust lever. This action in current-day RNAV scenarios automatically puts the aircraft into a ground track mode to simply level the wings, pitch the aircraft up and apply thrust as to make the aircraft climb quickly. These actions are simulated in the model for both RNAV and VCSPA-type approaches. In the VCSPA approach only, however, the TOGA button press by the pilot automatically switches the Nav display (Jack cockpit model) to highlight a breakaway track that the pilot must follow to take the aircraft out of the wake vortex or blunder situation. If the wake display is red, but the missed approach plan has not been communicated in the last 5 seconds, the pilots must **Assess Situation - Determine MA response - Communicate,** and then perform the TOGA procedure outlined above (ending the scenario). The PF/CA's task set in response the CSPO operation can be found in Figure 108 through Figure 124.

PF/CA Task Set to CSPO alert

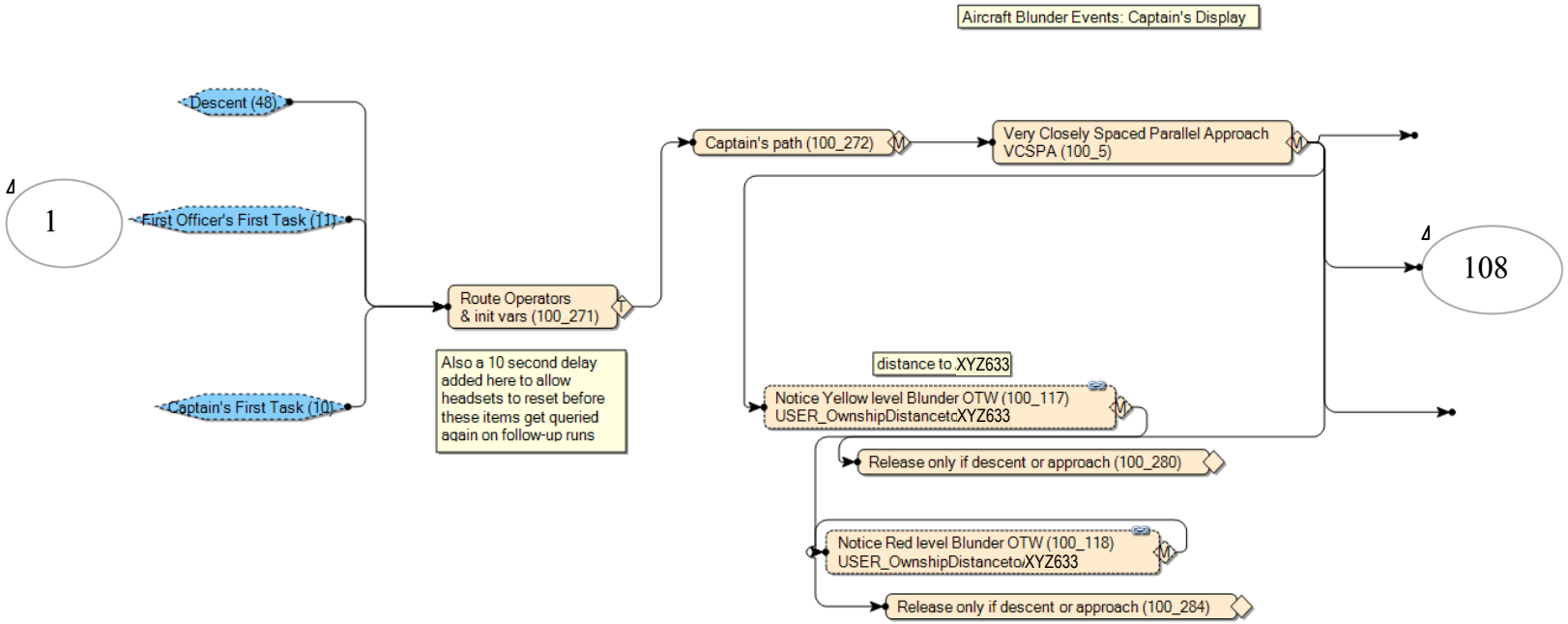


Figure 107. Task network of the PF/CA's path of a CSPO blunder events.

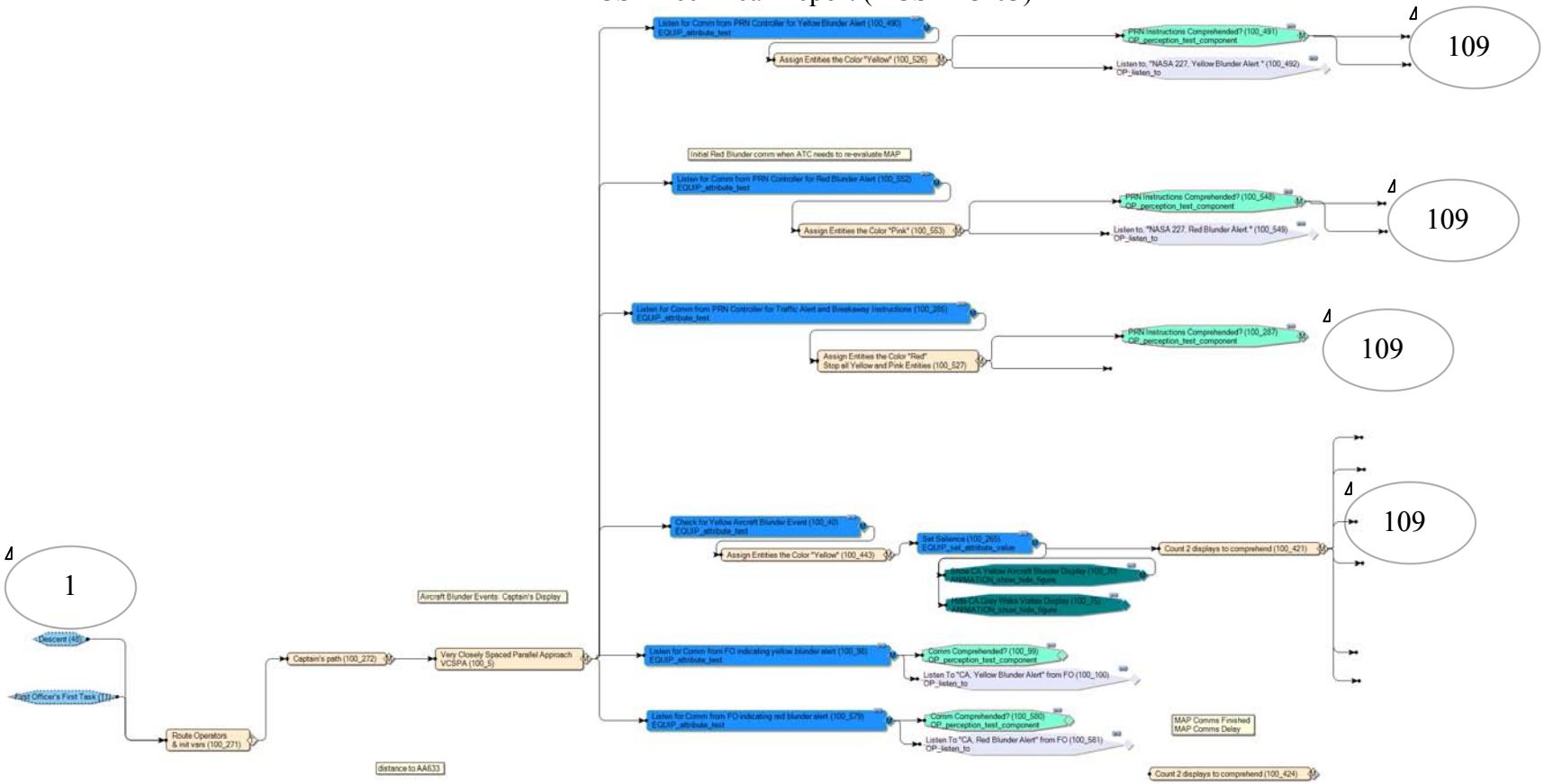


Figure 108. Task network of the aircraft yellow CSPO blunder events on the PF/CA's display.

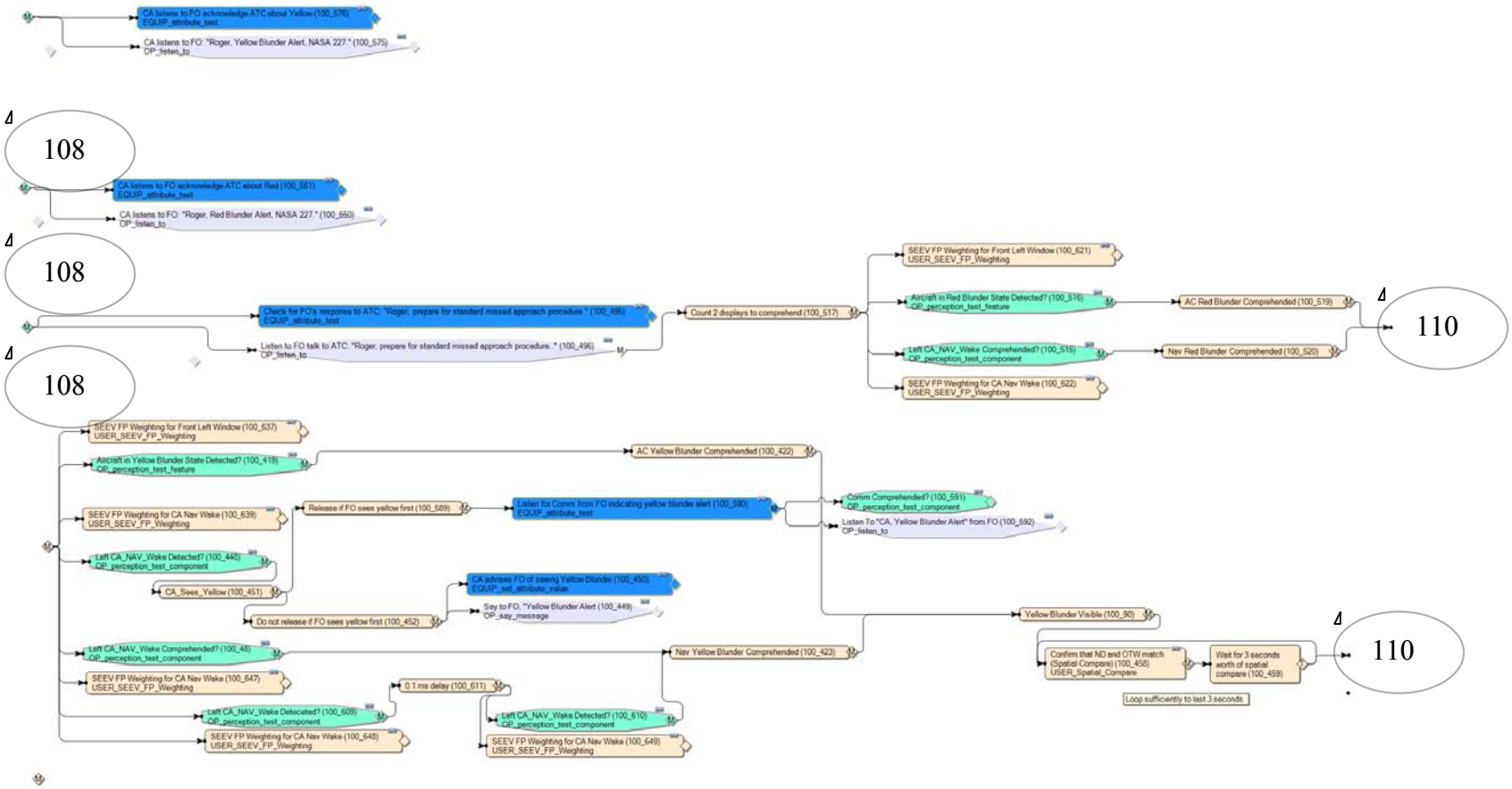


Figure 109. PF/CA task network of the aircraft CSPO blunder events on both displays for both yellow and red alerts, with associated SEEV task network settings illustrated.

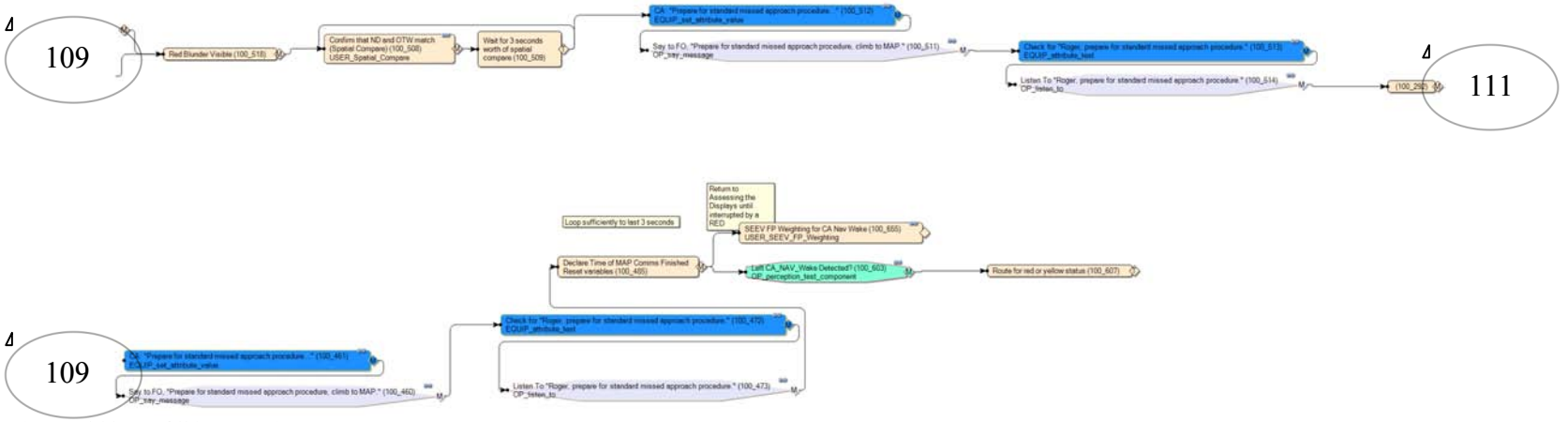


Figure 110. PF/CA tasks in response to red blunder alert.

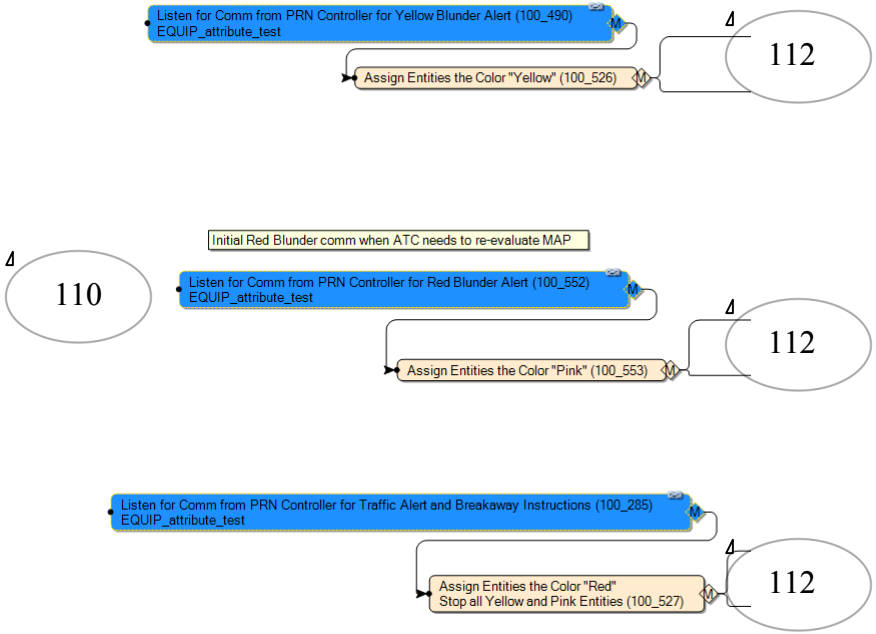


Figure 111. PF/CA tasks in response to the yellow, red alerts.

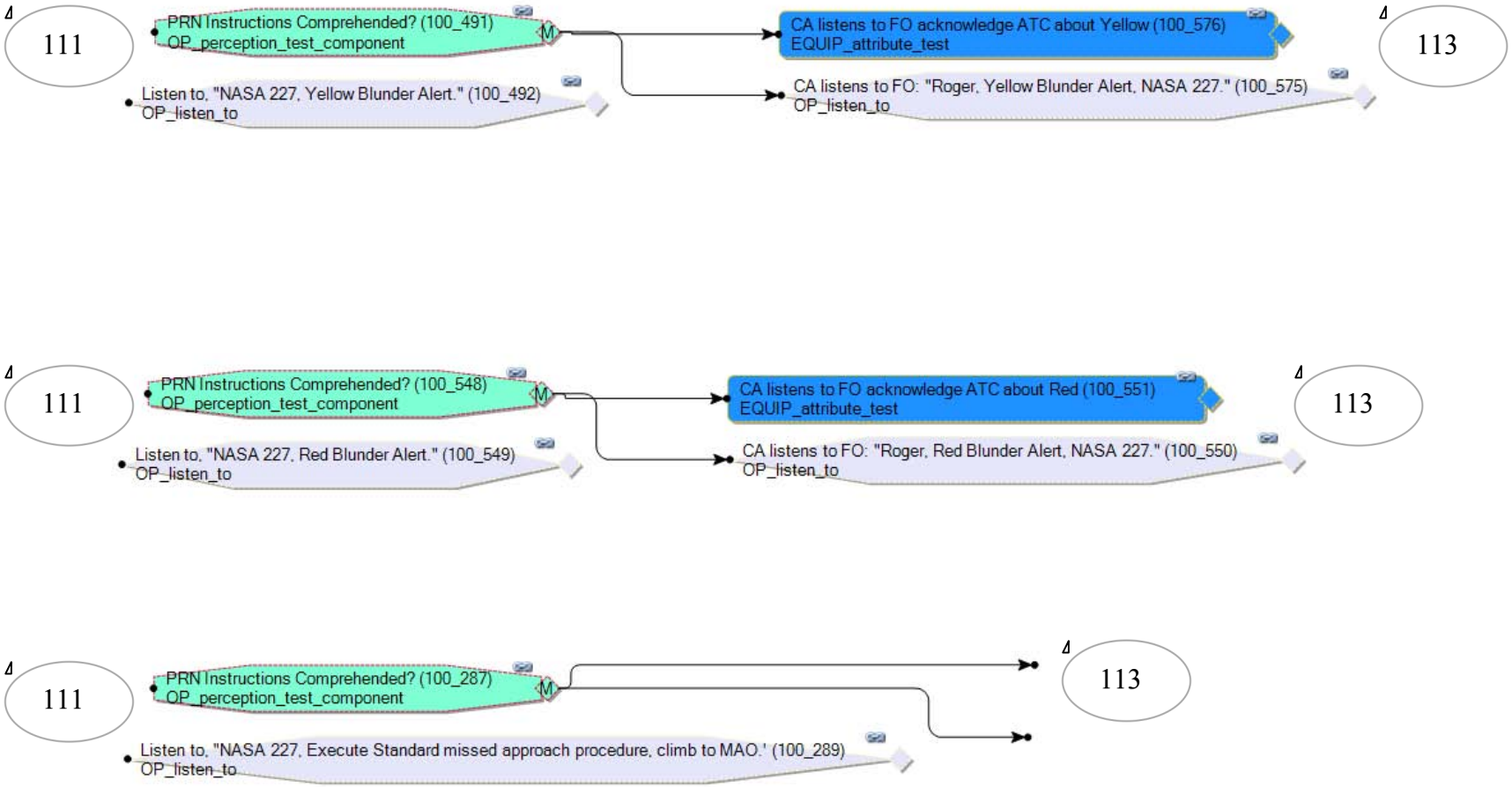


Figure 112. PF/CA comprehension tests for the recommended response to the yellow and red blunder alerts.

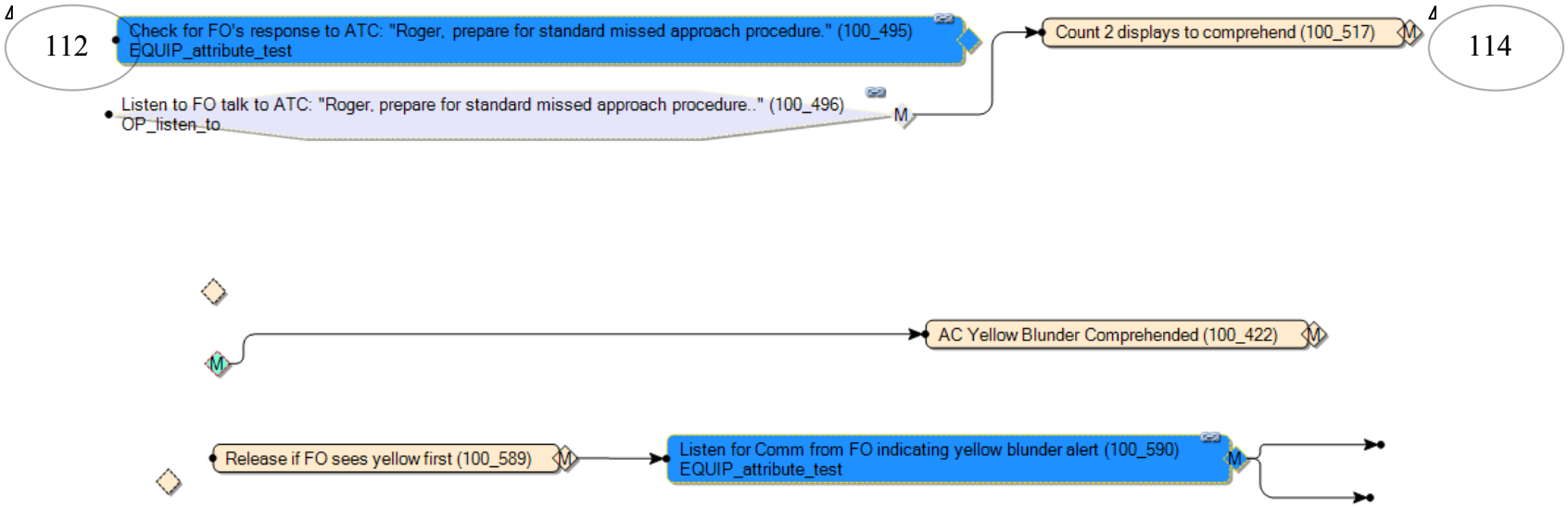


Figure 113. PF/CA yellow/red alert tasks and wait-for conditions.

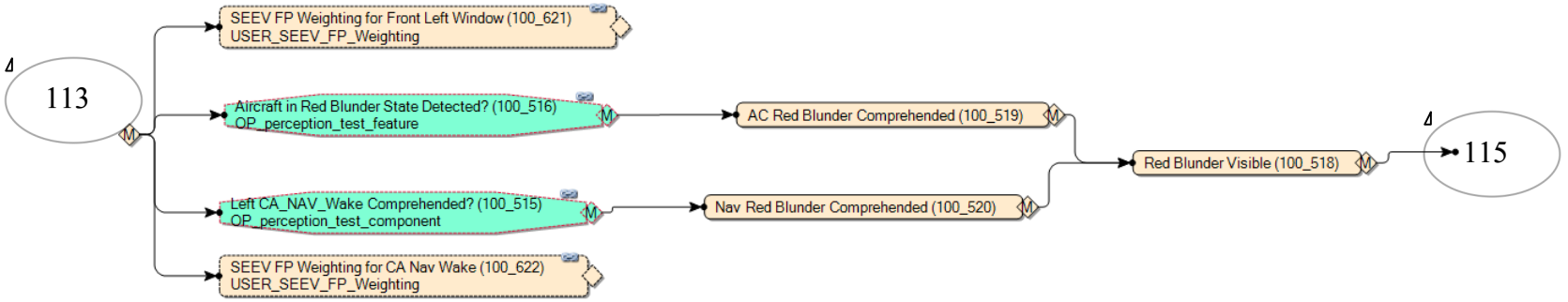


Figure 114. SEEV task set and perception tests for front left window and Nav-Wake display.

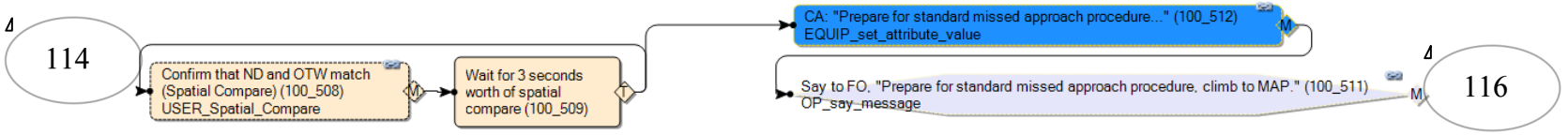


Figure 115. PF/CA confirmation that OTW and ND match.

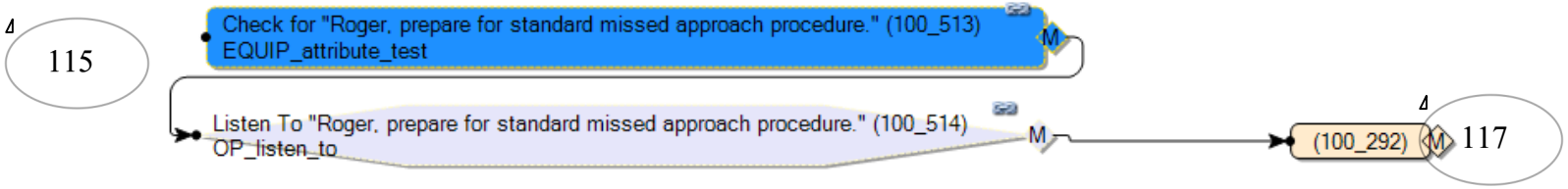


Figure 116. PF/CA Wait-for clause for the missed approach.

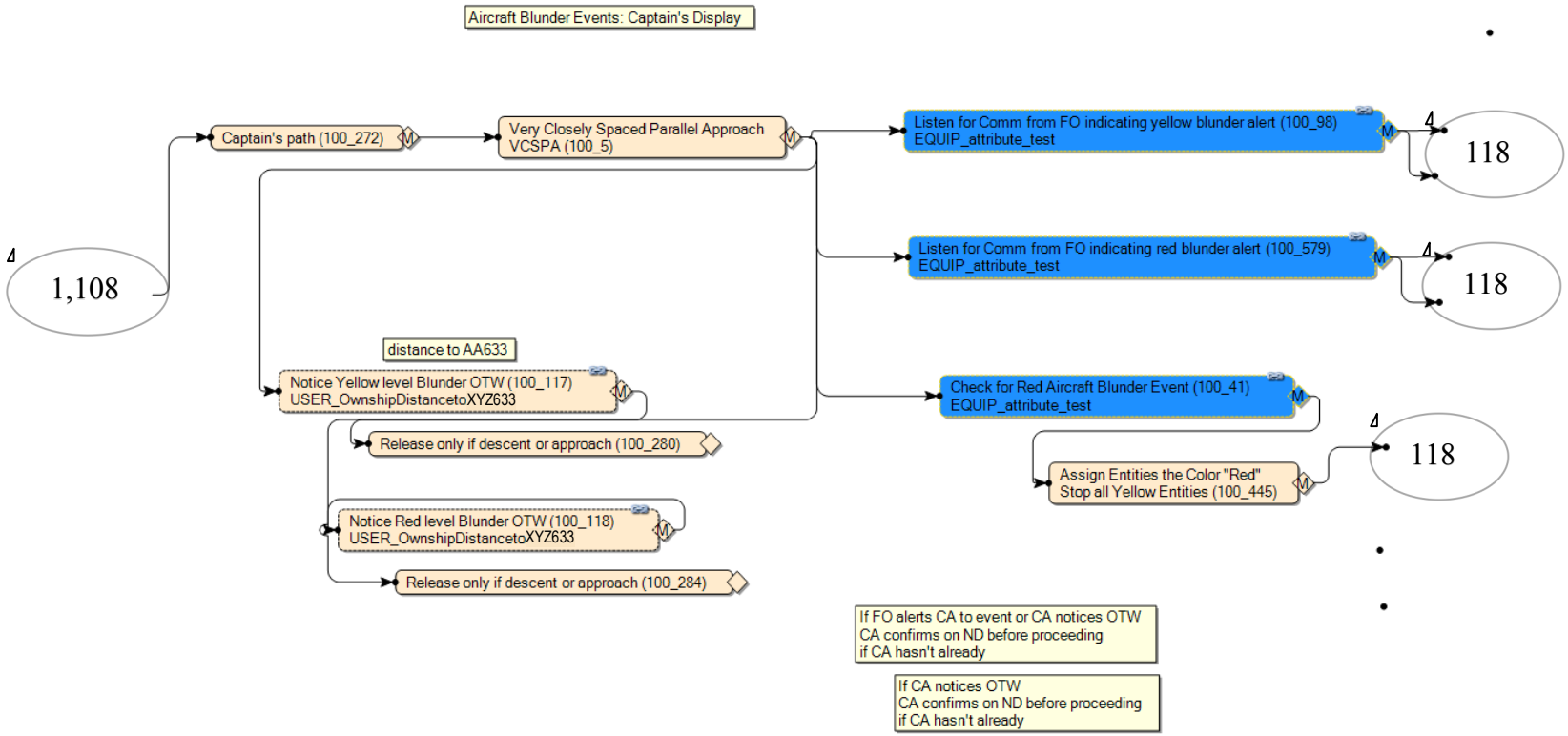


Figure 117. Details of the routing of the PF/CA's CSPO tasks.

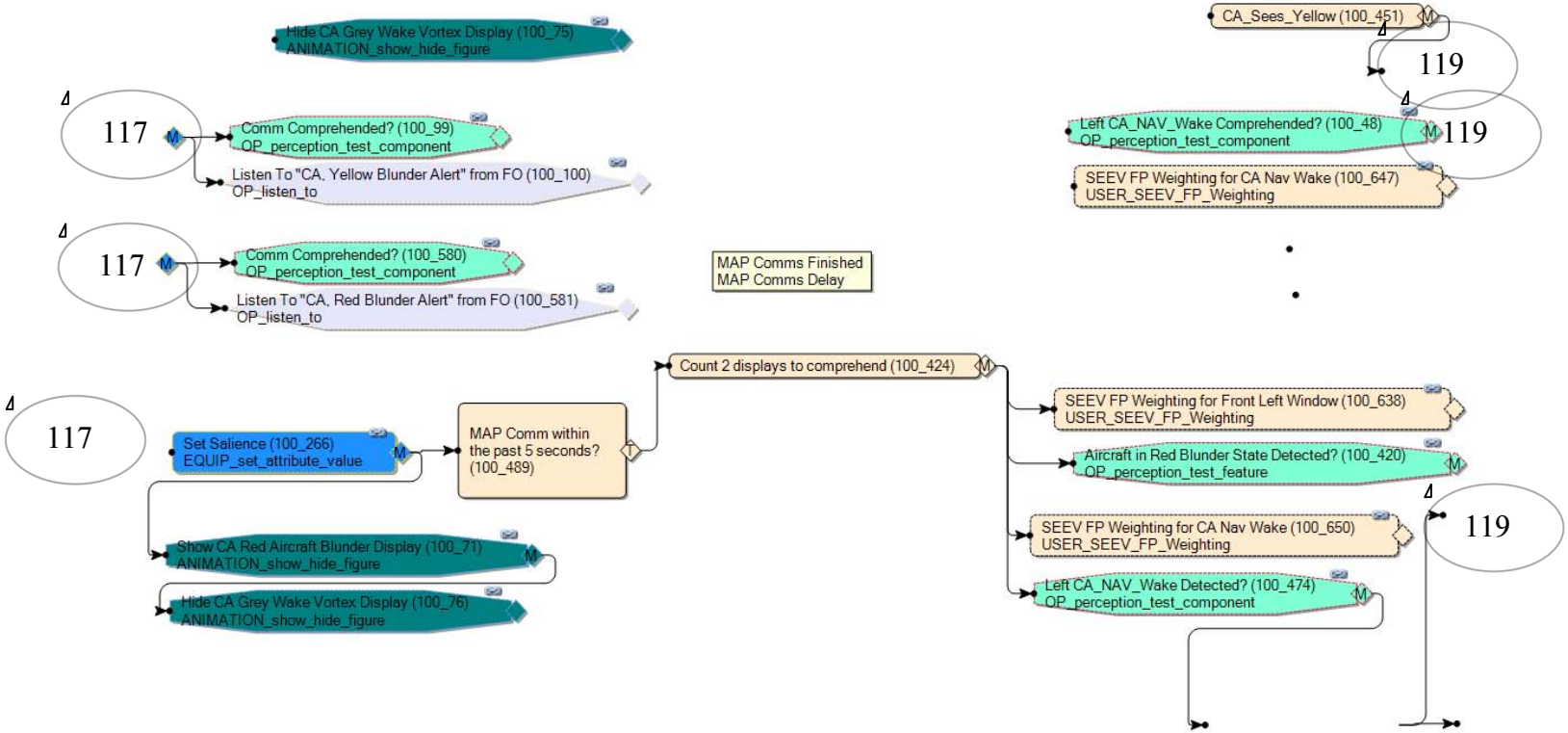


Figure 118. Flight deck SEEV task sets, salience value settings, and perception tests for red blunder states.

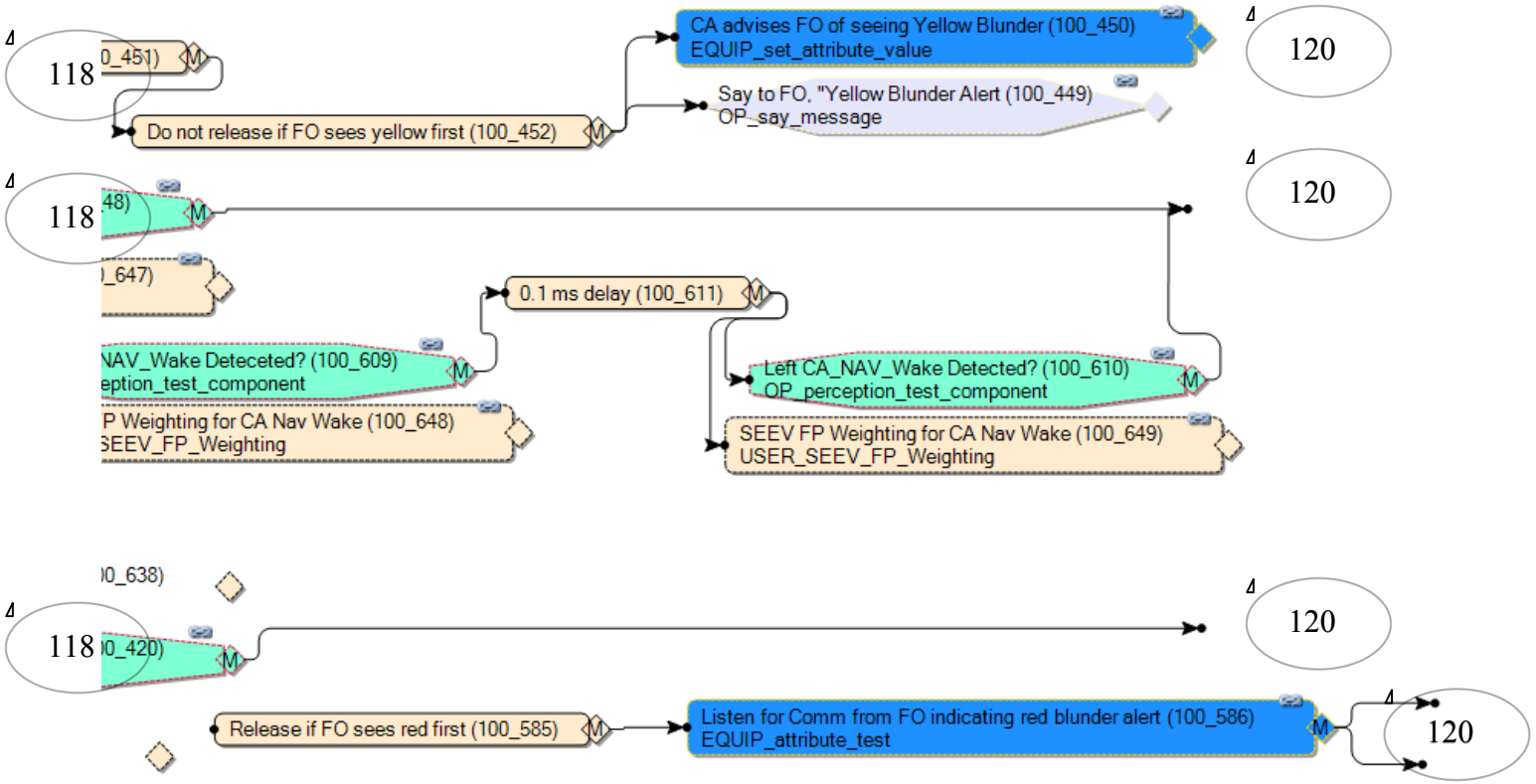


Figure 119. Logic of perception tests by both the PF/CA and the PNF/FO.

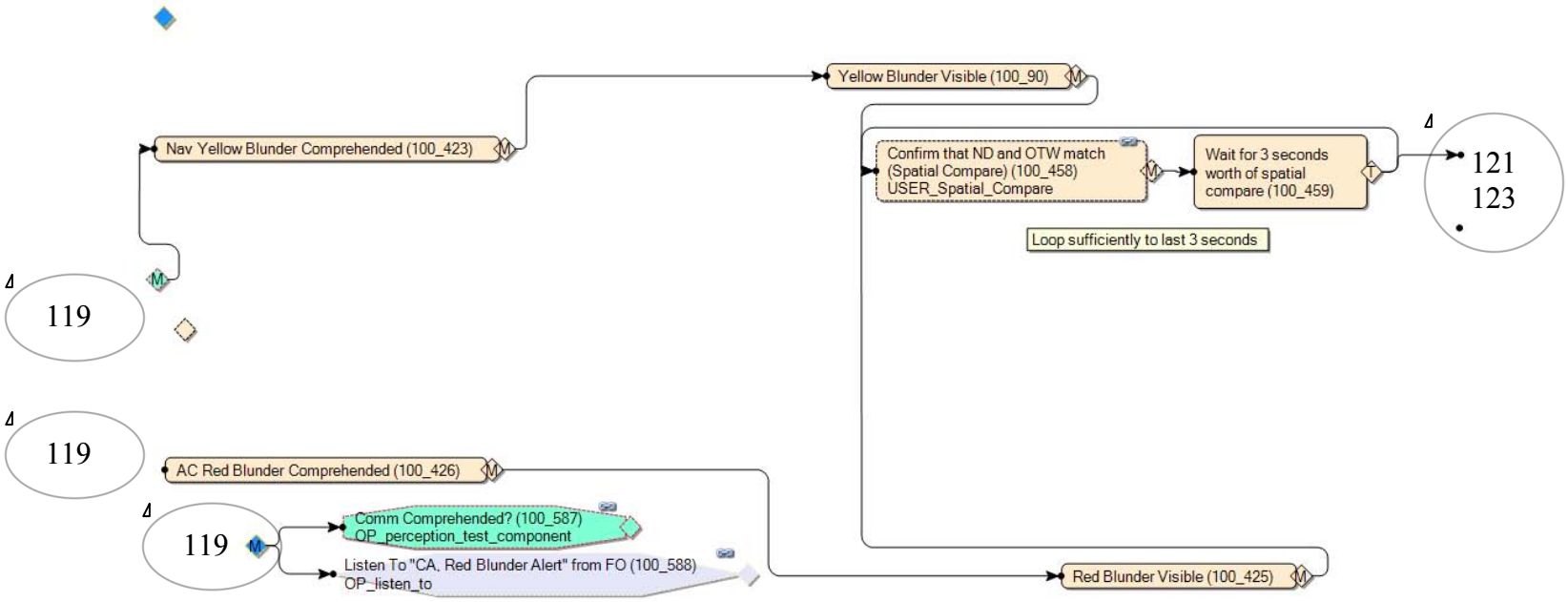


Figure 120. PF/CA response to missed approach call out.

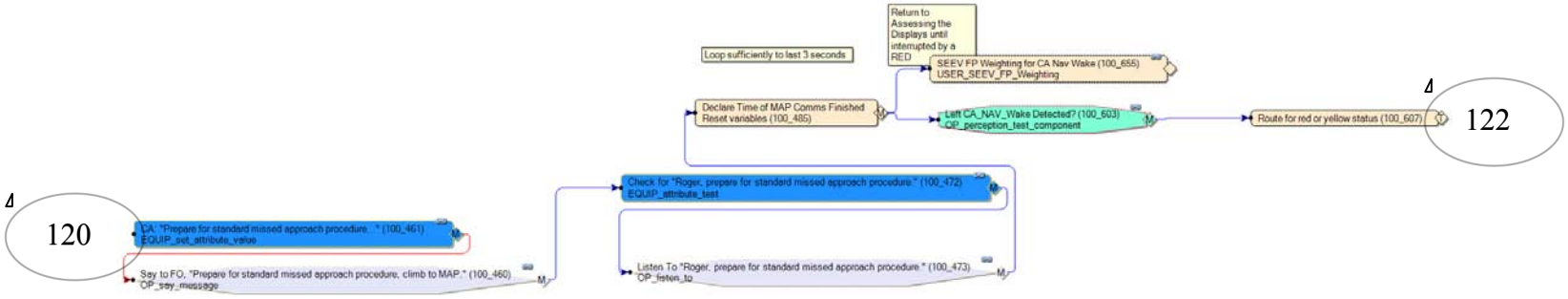


Figure 121. PF/CA response to missed approach call out.

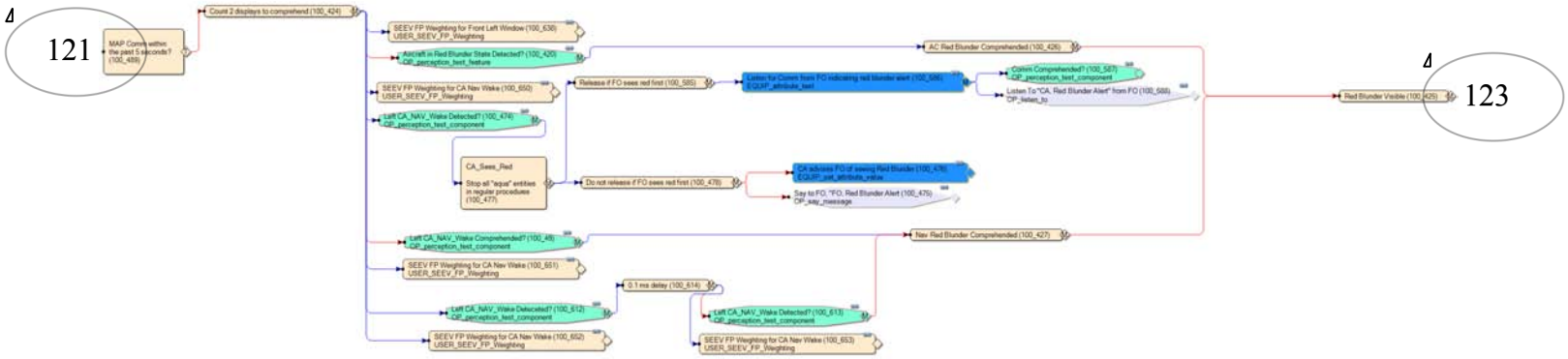


Figure 122. PF/CA SEEV Settings and weights associated with missed approach procedure.

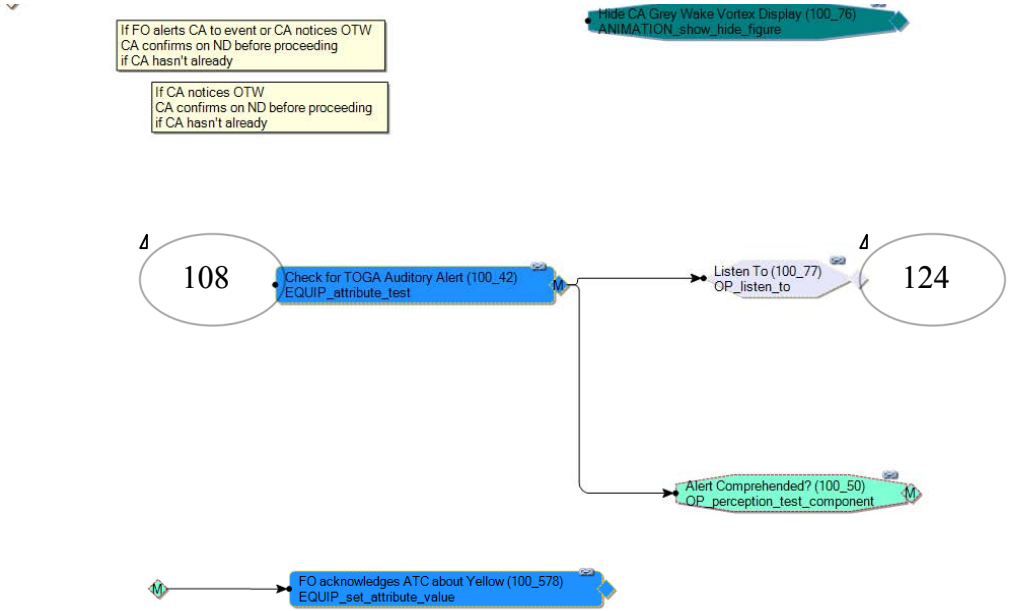


Figure 123. PF/CA comprehension and acknowledgement of alert information.

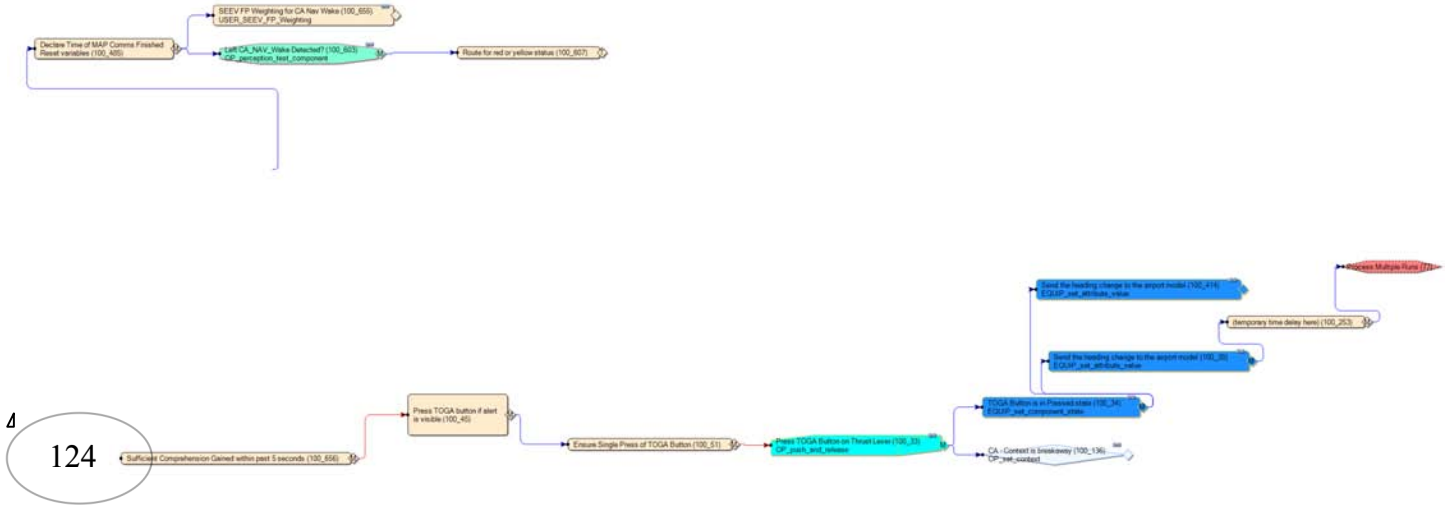


Figure 124. PF/CA TOGA Button Press action sequence.

PNF/FO's Tasks

The PNF/FO's CSPO routing task can be found in Figure 125. This path defines the CSPO operations for the PNF/FO. The complexity of the model and the number of interacting tasks necessitated taking a large perspective on the task network model (see Figure 126 on the next two pages.

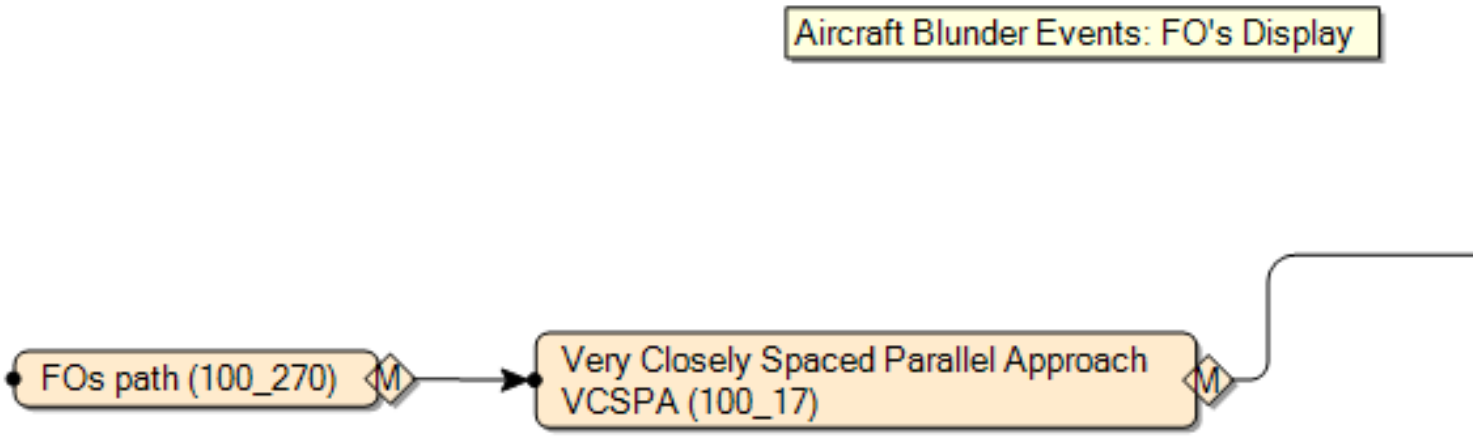
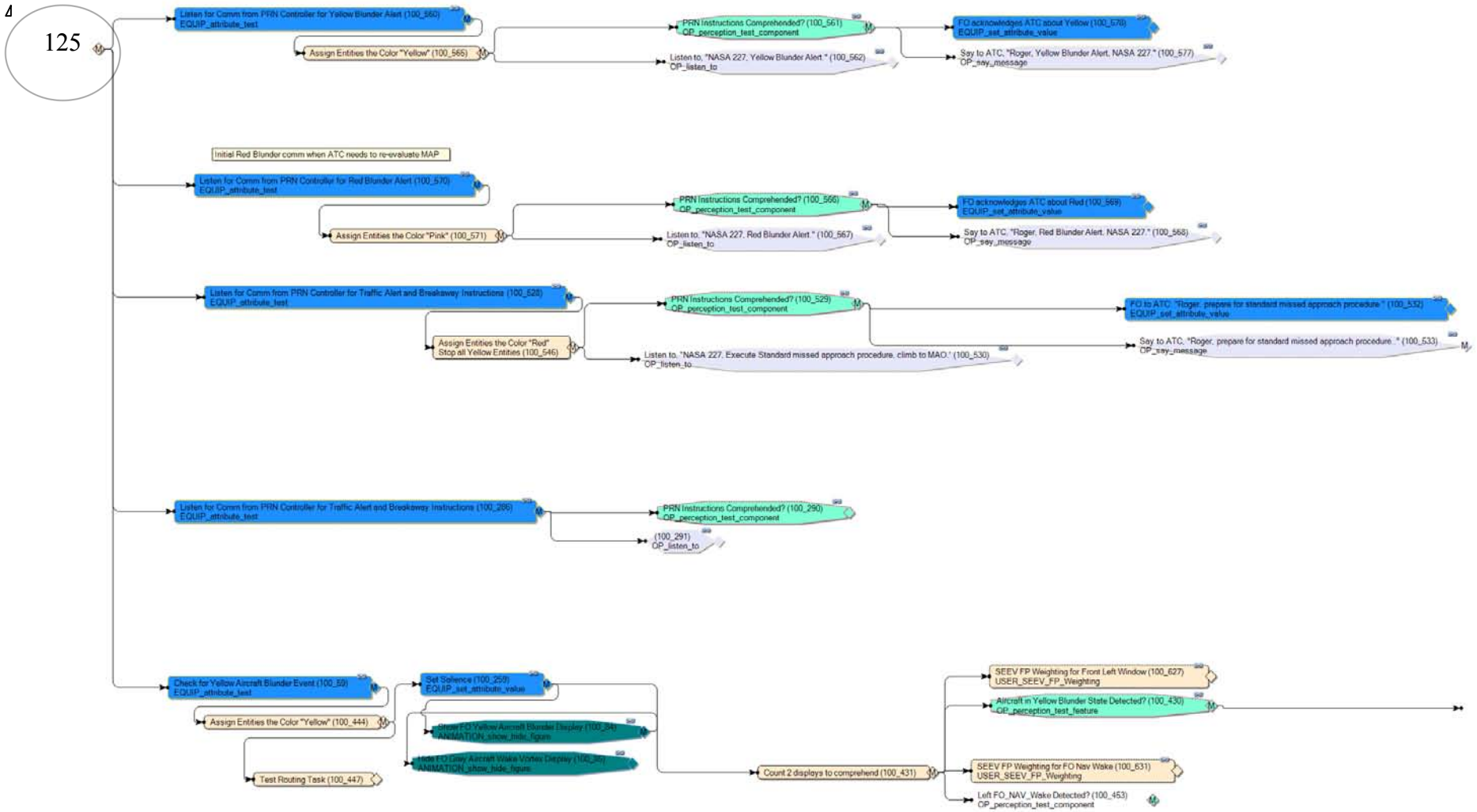
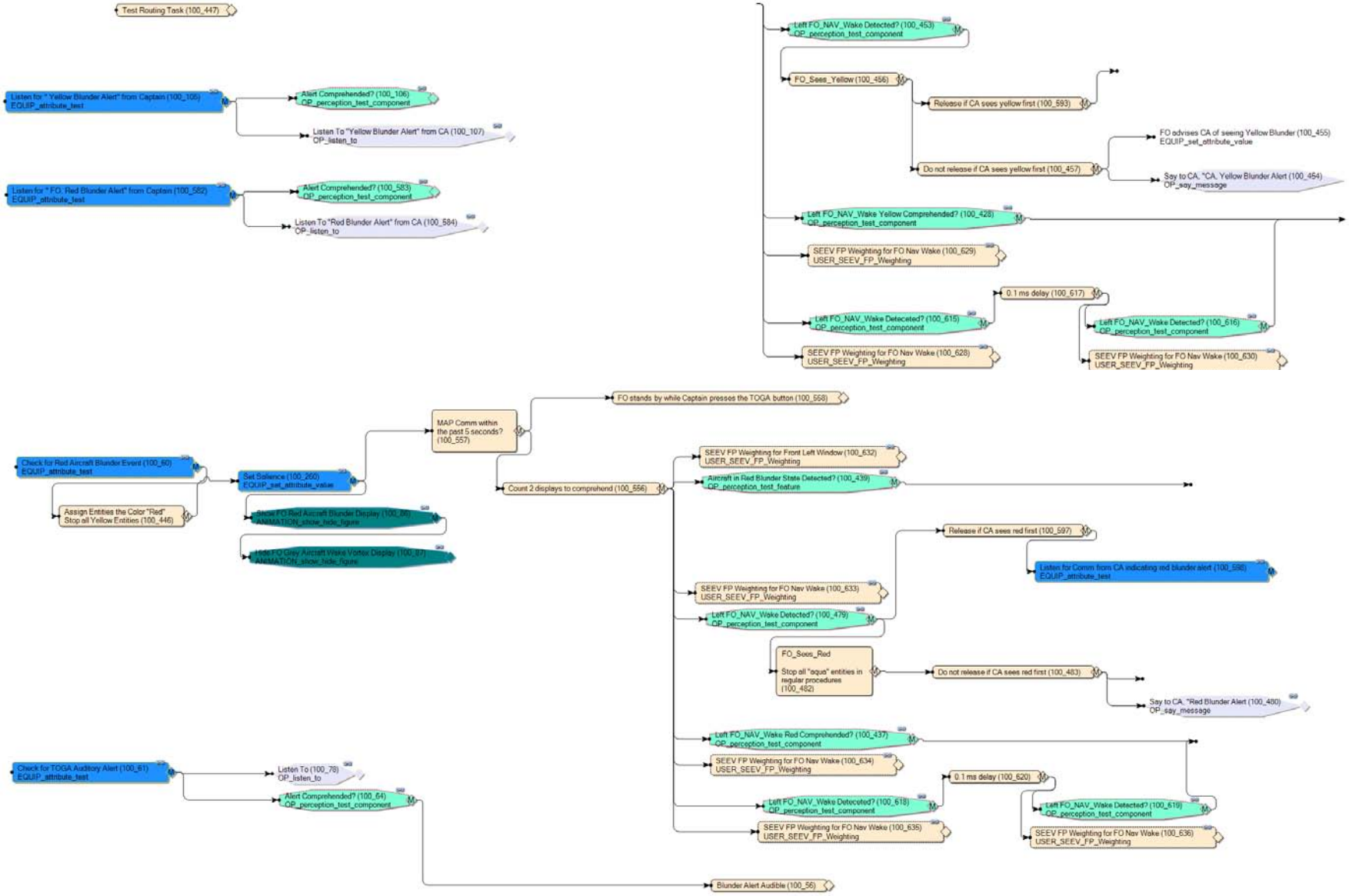
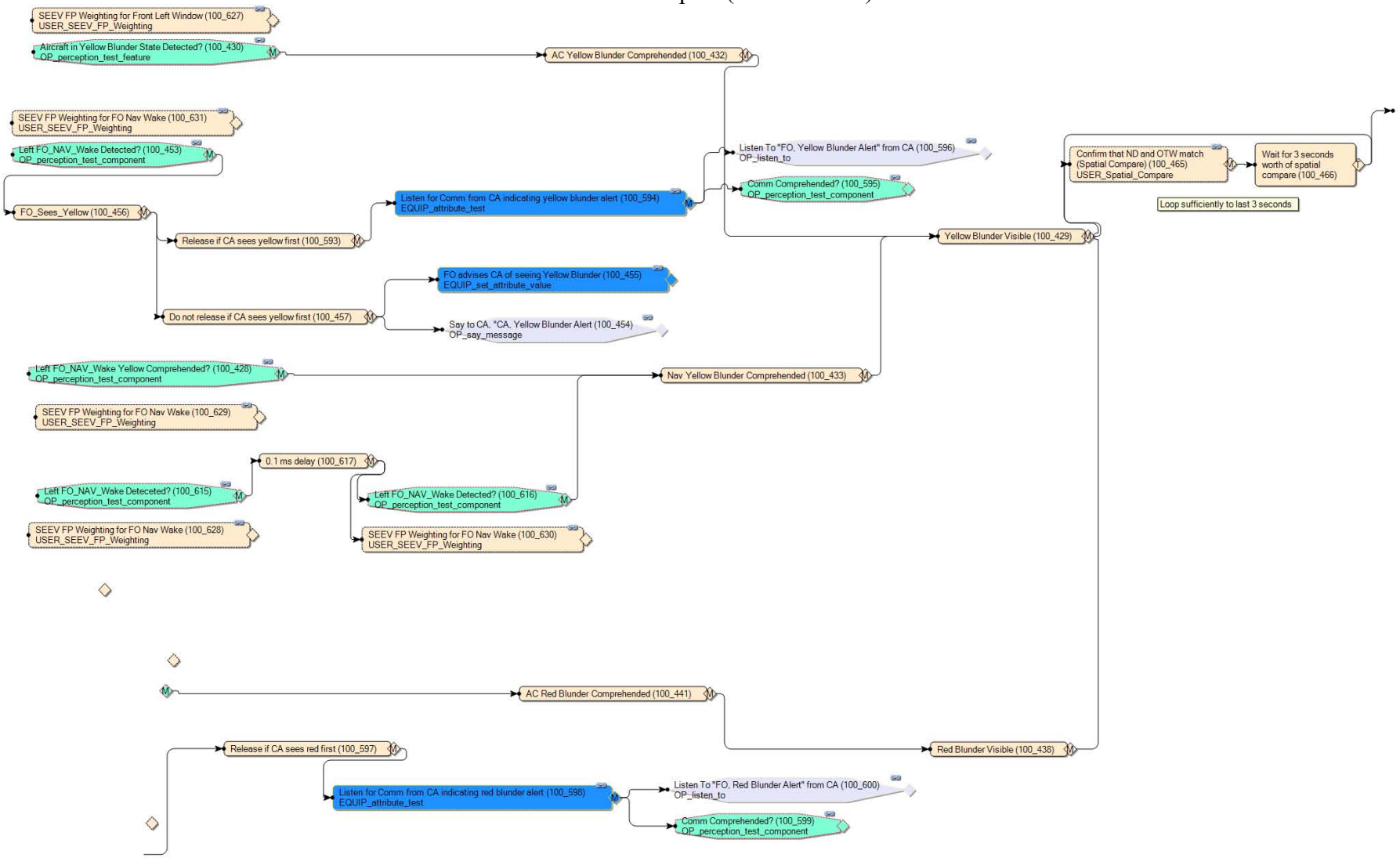
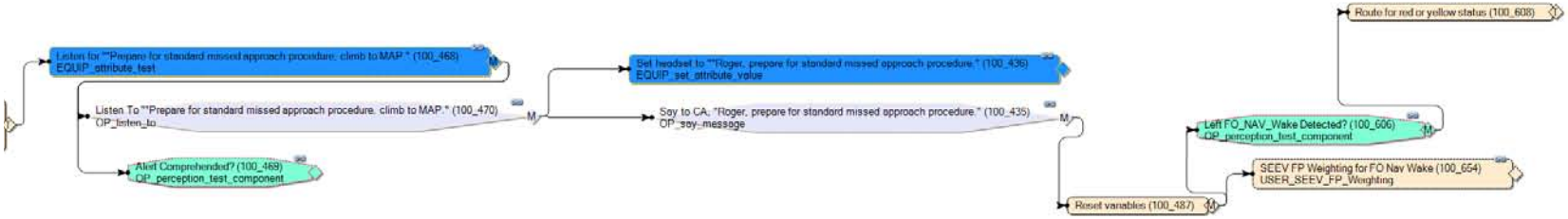


Figure 125. PNF/FOs path routing task for CSPO operations.


125
Listen for Comm from PRN Controller for Yellow Blunder Alert (100_560)
EQUIP_attribute_test
Assign Entities the Color "Yellow" (100_565)
PRN Instructions Comprehended? (100_561)
OP_perception_test_component
Listen to, "NASA 227, Yellow Blunder Alert." (100_562)
OP_listen_to
FO acknowledges ATC about Yellow (100_576)
EQUIP_set_attribute_value
Say to ATC, "Roger, Yellow Blunder Alert, NASA 227." (100_577)
OP_say_message
Initial Red Blunder comm when ATC needs to re-evaluate MAP
Listen for Comm from PRN Controller for Red Blunder Alert (100_570)
EQUIP_attribute_test
Assign Entities the Color "Pink" (100_571)
PRN Instructions Comprehended? (100_566)
OP_perception_test_component
Listen to, "NASA 227, Red Blunder Alert." (100_567)
OP_listen_to
FO acknowledges ATC about Red (100_569)
EQUIP_set_attribute_value
Say to ATC, "Roger, Red Blunder Alert, NASA 227." (100_568)
OP_say_message
Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions (100_528)
EQUIP_attribute_test
Assign Entities the Color "Red"
Stop all Yellow Entities (100_546)
PRN Instructions Comprehended? (100_529)
OP_perception_test_component
Listen to, "NASA 227, Execute Standard missed approach procedure, climb to MAO." (100_530)
OP_listen_to
FO to ATC, "Roger, prepare for standard missed approach procedure." (100_532)
EQUIP_set_attribute_value
Say to ATC, "Roger, prepare for standard missed approach procedure." (100_533)
OP_say_message
Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions (100_286)
EQUIP_attribute_test
PRN Instructions Comprehended? (100_290)
OP_perception_test_component
(100_291)
OP_listen_to
Check for Yellow Aircraft Blunder Event (100_59)
EQUIP_attribute_test
Assign Entities the Color "Yellow" (100_444)
Test Routing Task (100_447)
Set Salience (100_259)
EQUIP_set_attribute_value
Show FO Yellow Aircraft Blunder Display (100_84)
ANIMATION_show_hide_figure
Hide FO Grey Aircraft Wake Vortex Display (100_86)
ANIMATION_show_hide_figure
Count 2 displays to comprehend (100_431)
SEEV FP Weighting for Front Left Window (100_627)
USER_SEEV_FP_Weighting
Aircraft in Yellow Blunder State Detected? (100_430)
OP_perception_test_feature
SEEV FP Weighting for FO Nav Wake (100_631)
USER_SEEV_FP_Weighting
Left FO_NAV_Wake Detected? (100_453)
OP_perception_test_component


Test Routing Task (100_447)
Listen for " Yellow Blunder Alert" from Captain (100_105)
EQUIP_attribute_test
Alert Comprehended? (100_106)
OP_perception_test_component
Listen To "Yellow Blunder Alert" from CA (100_107)
OP_listen_to
Listen for " FO, Red Blunder Alert" from Captain (100_582)
EQUIP_attribute_test
Alert Comprehended? (100_583)
OP_perception_test_component
Listen To "Red Blunder Alert" from CA (100_584)
OP_listen_to
Left FO_NAV_Wake Detected? (100_453)
OP_perception_test_component
FO_Sees_Yellow (100_456)
Release if CA sees yellow first (100_593)
Do not release if CA sees yellow first (100_457)
FO advises CA of seeing Yellow Blunder (100_455)
EQUIP_set_attribute_value
Say to CA, "CA, Yellow Blunder Alert (100_454)
OP_say_message
Left FO_NAV_Wake Yellow Comprehended? (100_428)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_629)
USER_SEEV_FP_Weighting
0.1 ms delay (100_617)
Left FO_NAV_Wake Detected? (100_615)
OP_perception_test_component
Left FO_NAV_Wake Detected? (100_616)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_628)
USER_SEEV_FP_Weighting
SEEV FP Weighting for FO Nav Wake (100_630)
USER_SEEV_FP_Weighting
FO stands by while Captain presses the TOGA button (100_558)
MAP Comm within the past 5 seconds? (100_557)
Check for Red Aircraft Blunder Event (100_60)
EQUIP_attribute_test
Set Salience (100_260)
EQUIP_set_attribute_value
Assign Entities the Color "Red"
Stop all Yellow Entities (100_446)
Show FO Red Aircraft Blunder Display (100_86)
ANIMATION_show_hide_figure
Hide FO Grey Aircraft Wake Vortex Display (100_87)
ANIMATION_show_hide_figure
Count 2 displays to comprehend (100_556)
SEEV FP Weighting for Front Left Window (100_632)
USER_SEEV_FP_Weighting
Aircraft in Red Blunder State Detected? (100_439)
OP_perception_test_feature
Release if CA sees red first (100_597)
Listen for Comm from CA indicating red blunder alert (100_598)
EQUIP_attribute_test
SEEV FP Weighting for FO Nav Wake (100_633)
USER_SEEV_FP_Weighting
Left FO_NAV_Wake Detected? (100_479)
OP_perception_test_component
FO_Sees_Red
Stop all "aqua" entities in regular procedures (100_482)
Do not release if CA sees red first (100_483)
Say to CA, "Red Blunder Alert (100_480)
OP_say_message
Left FO_NAV_Wake Red Comprehended? (100_437)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_634)
USER_SEEV_FP_Weighting
0.1 ms delay (100_620)
Left FO_NAV_Wake Detected? (100_618)
OP_perception_test_component
Left FO_NAV_Wake Detected? (100_619)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_635)
USER_SEEV_FP_Weighting
SEEV FP Weighting for FO Nav Wake (100_636)
USER_SEEV_FP_Weighting
Check for TOGA Auditory Alert (100_61)
EQUIP_attribute_test
Listen To (100_78)
OP_listen_to
Alert Comprehended? (100_64)
OP_perception_test_component
Blunder Alert Audible (100_56)


SEEV FP Weighting for Front Left Window (100_627)
USER_SEEV_FP_Weighting
Aircraft in Yellow Blunder State Detected? (100_430)
OP_perception_test_feature
AC Yellow Blunder Comprehended (100_432)
SEEV FP Weighting for FO Nav Wake (100_631)
USER_SEEV_FP_Weighting
Left FO_NAV_Wake Detected? (100_453)
OP_perception_test_component
Listen To "FO, Yellow Blunder Alert" from CA (100_596)
OP_listen_to
Comm Comprehended? (100_595)
OP_perception_test_component
Confirm that ND and OTW match (Spatial Compare) (100_465)
USER_Spatial_Compare
Wait for 3 seconds worth of spatial compare (100_466)
Loop sufficiently to last 3 seconds
FO_Sees_Yellow (100_456)
Listen for Comm from CA indicating yellow blunder alert (100_594)
EQUIP_attribute_test
Release if CA sees yellow first (100_593)
Yellow Blunder Visible (100_429)
FO advises CA of seeing Yellow Blunder (100_455)
EQUIP_set_attribute_value
Do not release if CA sees yellow first (100_457)
Say to CA, "CA, Yellow Blunder Alert (100_454)
OP_say_message
Left FO_NAV_Wake Yellow Comprehended? (100_428)
OP_perception_test_component
Nav Yellow Blunder Comprehended (100_433)
SEEV FP Weighting for FO Nav Wake (100_629)
USER_SEEV_FP_Weighting
0.1 ms delay (100_617)
Left FO_NAV_Wake Deteceted? (100_615)
OP_perception_test_component
Left FO_NAV_Wake Detected? (100_616)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_628)
USER_SEEV_FP_Weighting
SEEV FP Weighting for FO Nav Wake (100_630)
USER_SEEV_FP_Weighting
AC Red Blunder Comprehended (100_441)
Release if CA sees red first (100_597)
Red Blunder Visible (100_438)
Listen for Comm from CA indicating red blunder alert (100_598)
EQUIP_attribute_test
Listen To "FO, Red Blunder Alert" from CA (100_600)
OP_listen_to
Comm Comprehended? (100_599)
OP_perception_test_component


Listen for ""Prepare for standard missed approach procedure, climb to MAP." (100_468)
EQUIP_attribute_test
Listen To ""Prepare for standard missed approach procedure, climb to MAP." (100_470)
OP_listen_to
Alert Comprehended? (100_469)
OP_perception_test_component
Set headset to ""Roger, prepare for standard missed approach procedure." (100_436)
EQUIP_set_attribute_value
Say to CA, "Roger, prepare for standard missed approach procedure." (100_435)
OP_say_message
Reset variables (100_487)
Route for red or yellow status (100_608)
Left FO_NAV_Wake Detected? (100_606)
OP_perception_test_component
SEEV FP Weighting for FO Nav Wake (100_654)
USER_SEEV_FP_Weighting

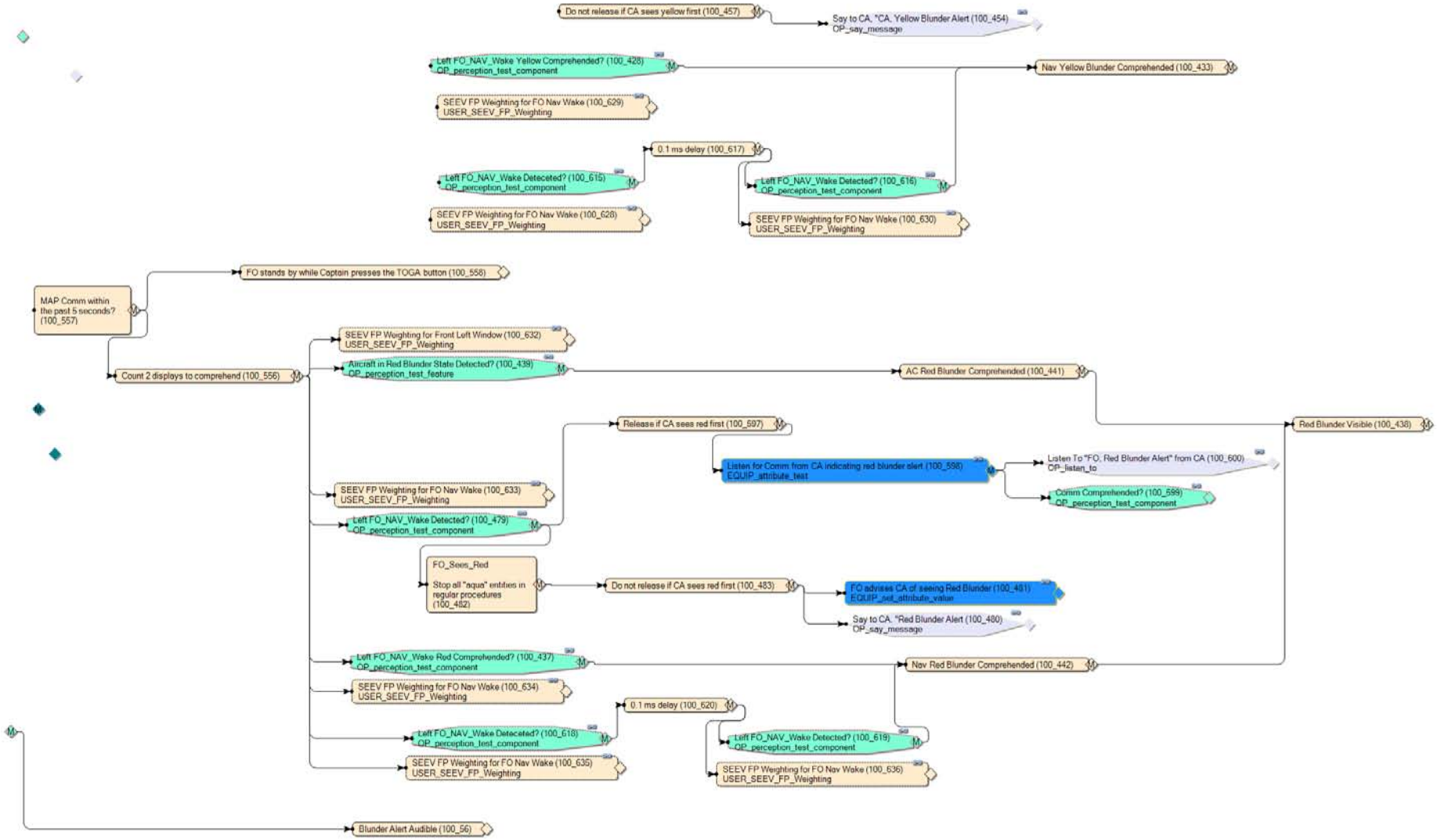


Figure 126. Network of tasks required by the PNF/FO in response to the wake display nominal, yellow and red alert phases.

Air Traffic Control Tasks

While the approach and land blunder scenario focused on the flight deck and had higher fidelity on the tasks included in the scenario, the Air Traffic Controller was also represented, albeit at a much coarser level of fidelity. Figure 127 illustrates that the controllers represented included the approach controller, the tower controller, the ground controller and the ramp tower controller. As with the other parts of the model, the primary interest was on the approach controller and the tower controller interactions with the flight deck. The other controllers were not activated in the current analysis.

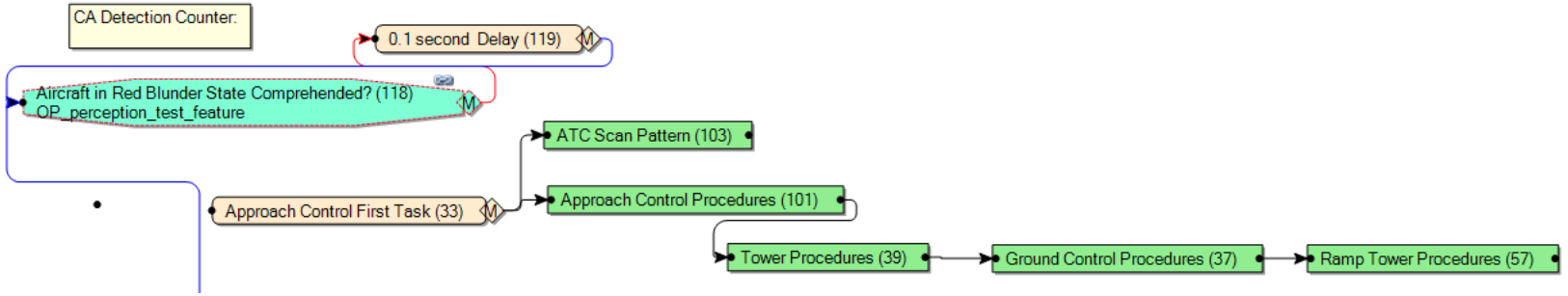


Figure 127. High level snapshot of the air traffic control tasks and scan patterns.

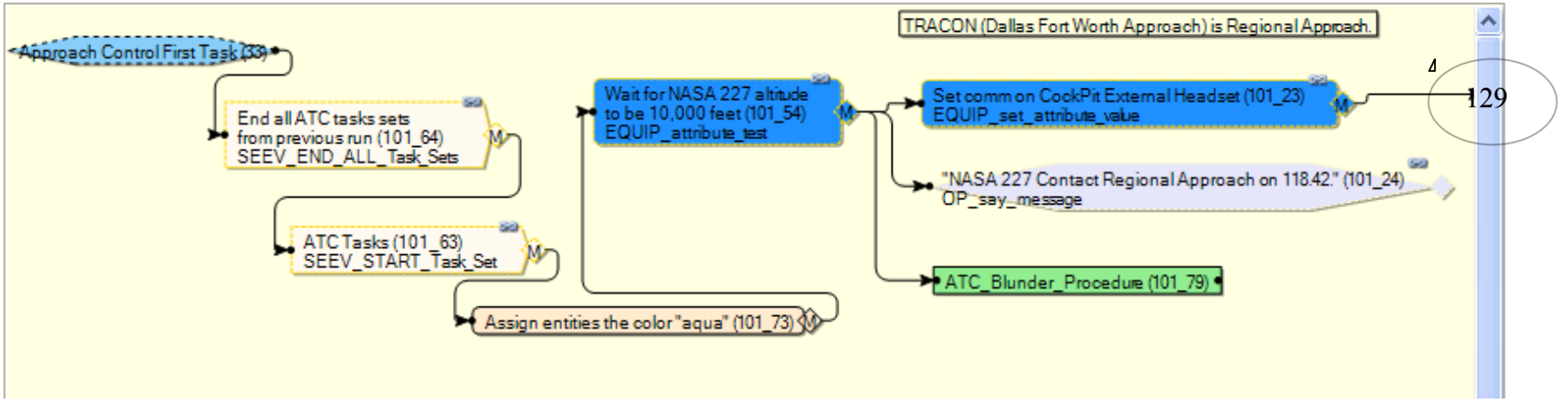


Figure 128. ATC responsible approach control procedure.

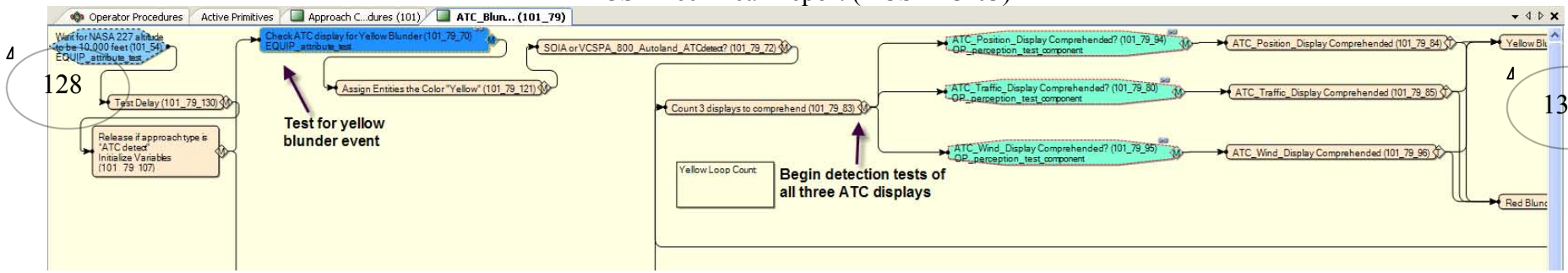


Figure 129. ATC responsible yellow blunder event approach control procedures (from network 101_79).

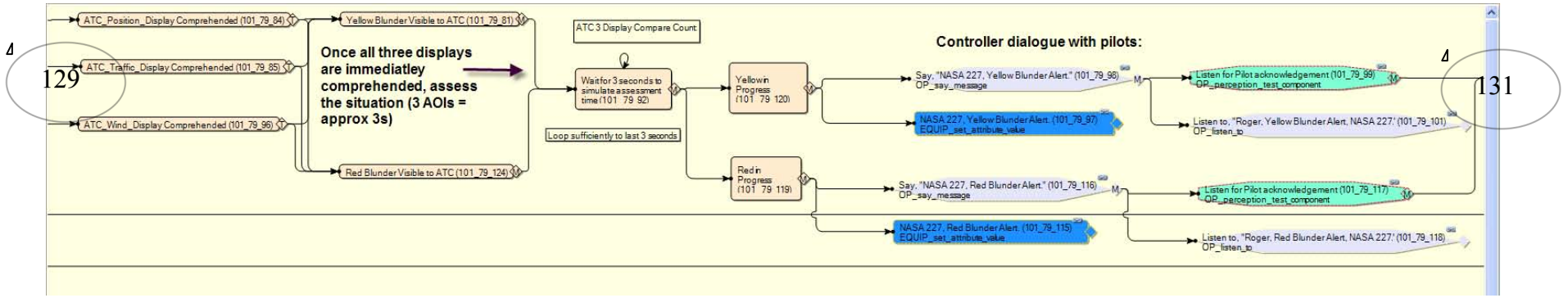


Figure 130. ATC responsible controller dialogue with pilots.

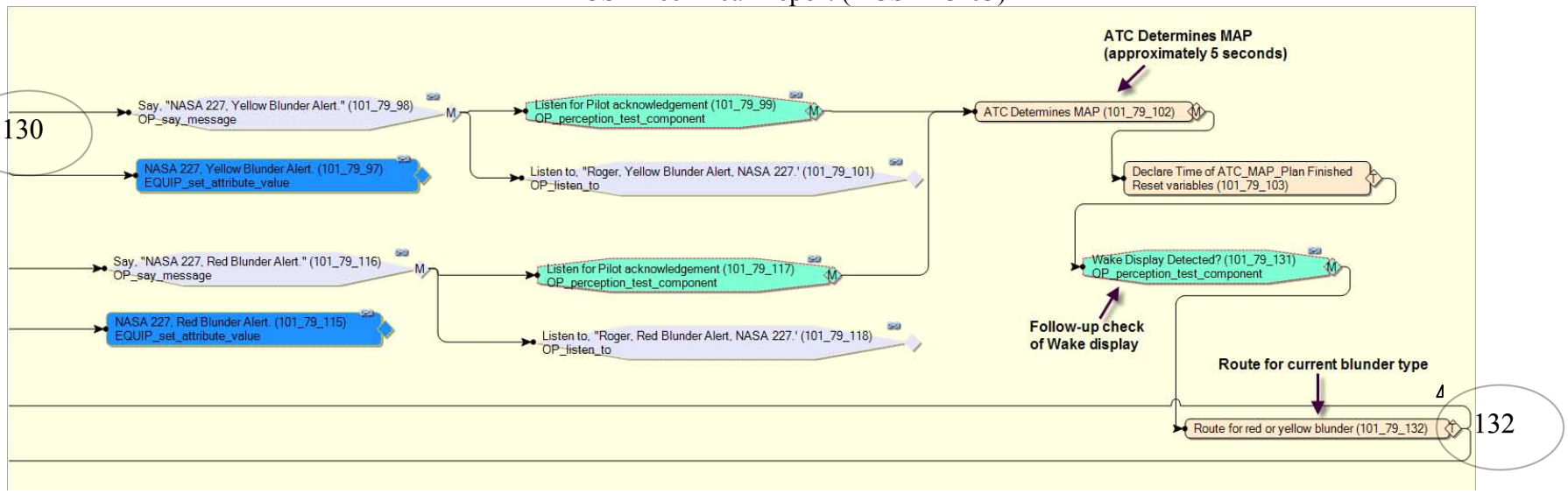


Figure 131. ATC responsible determining the MAP and the pilot acknowledgment.

3. Red Blunder Event:

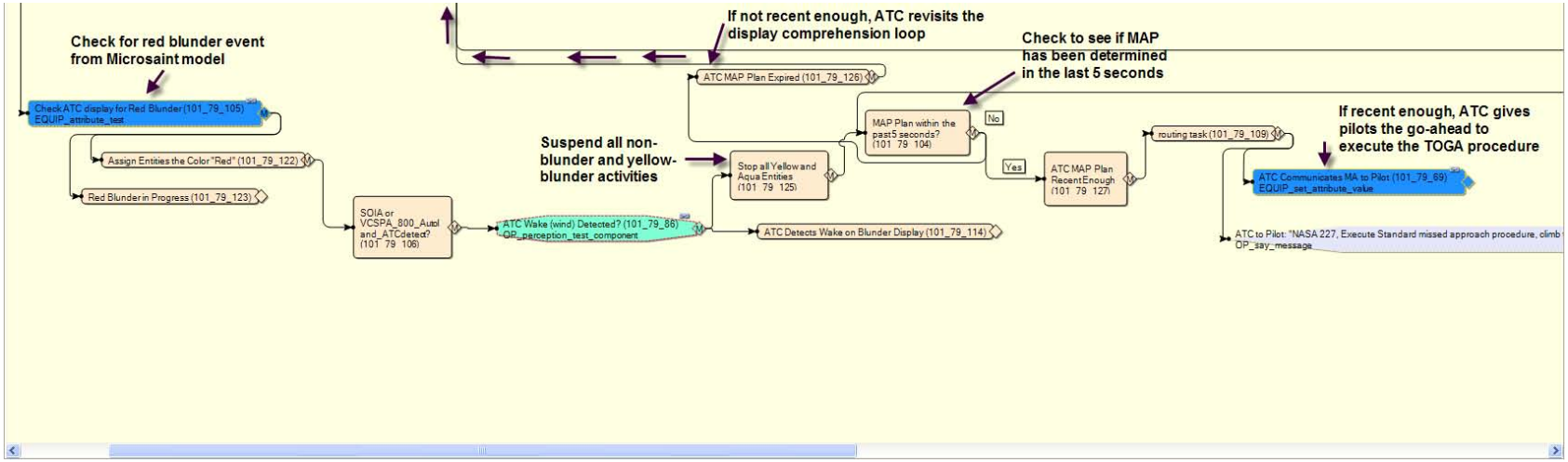


Figure 132. ATC responsible red blunder event tasks.

The pilots' first task in response to the ATC responsible alert is contained in the wake vortex attention network as illustrated in Figure 133.

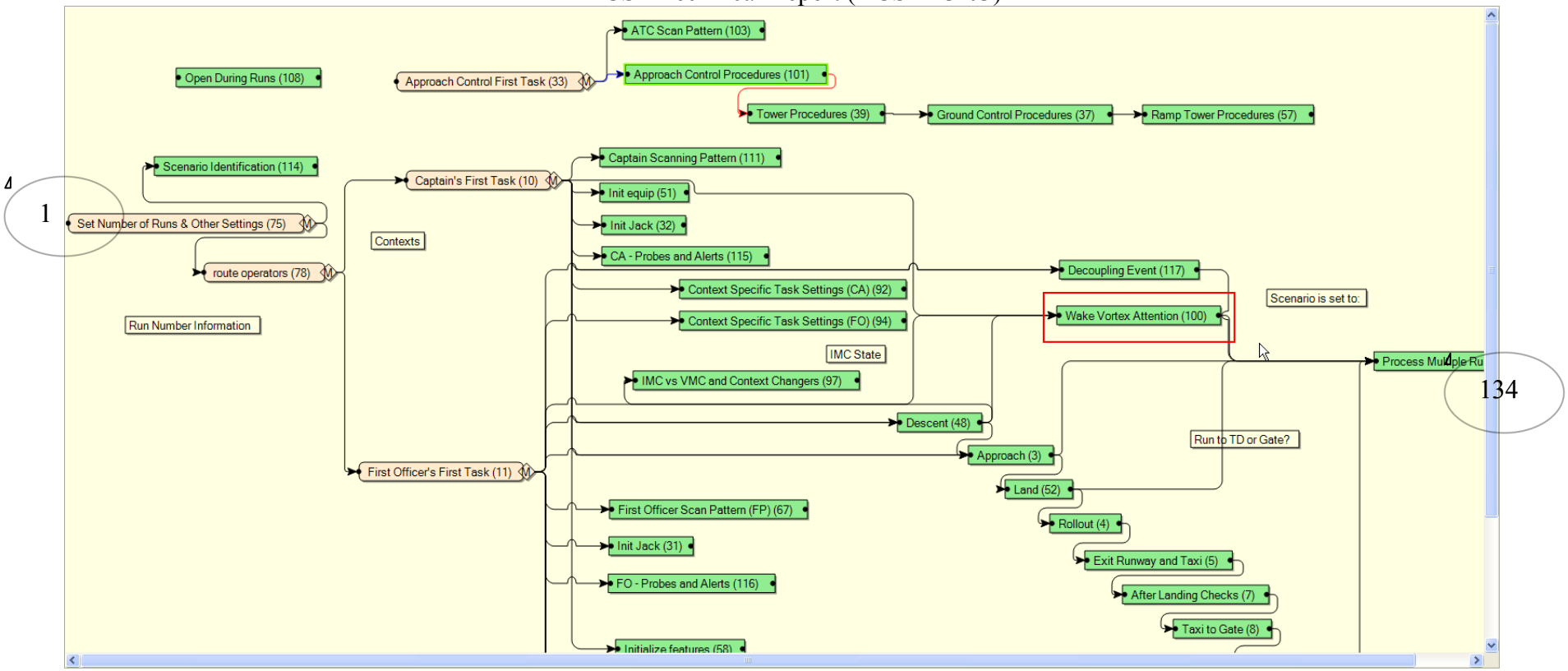


Figure 133. Wake vortex pilot attention response in the ATC responsible scenario.

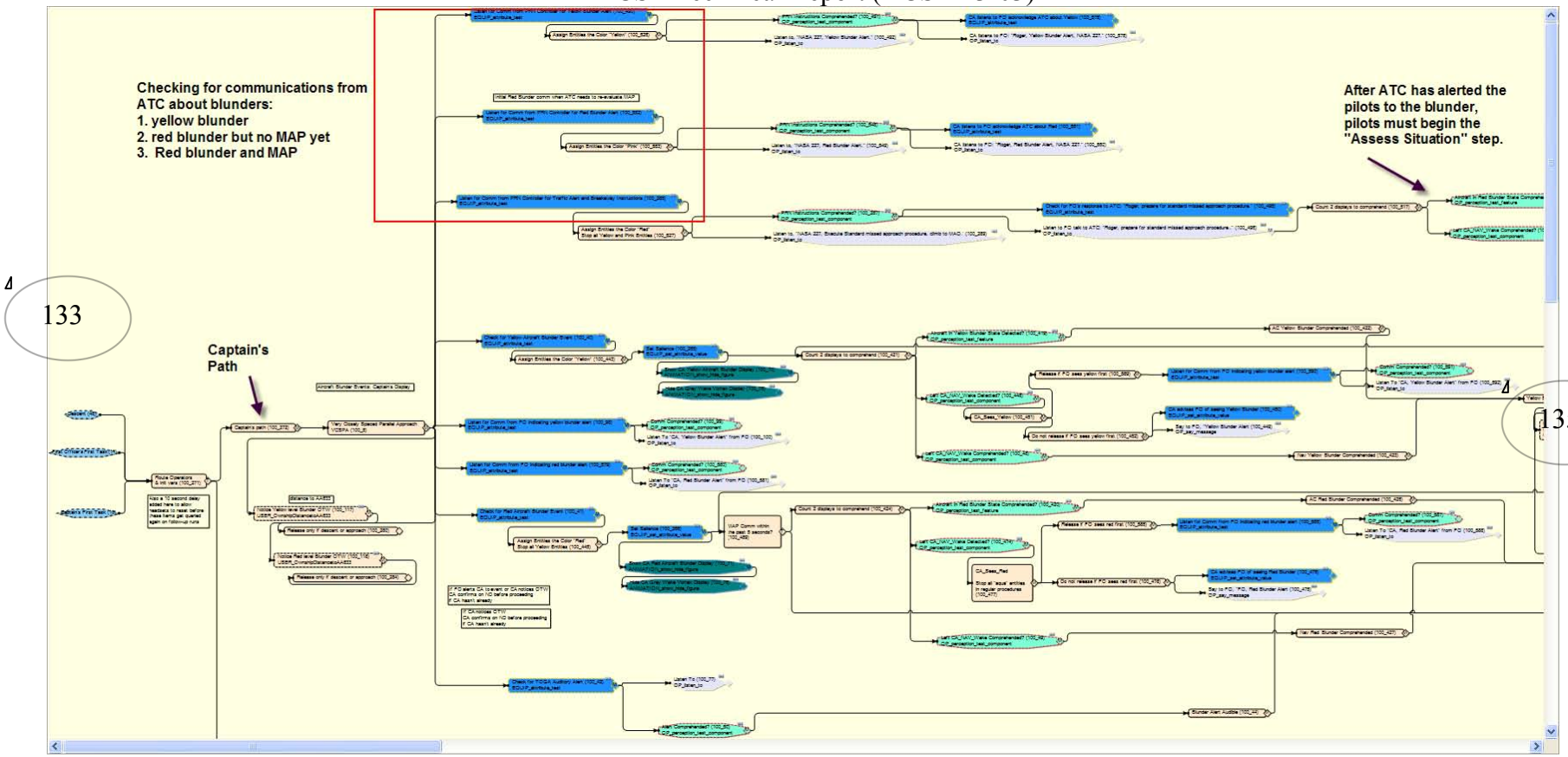


Figure 134. Pilot response in the ATC responsible to the blunder event.

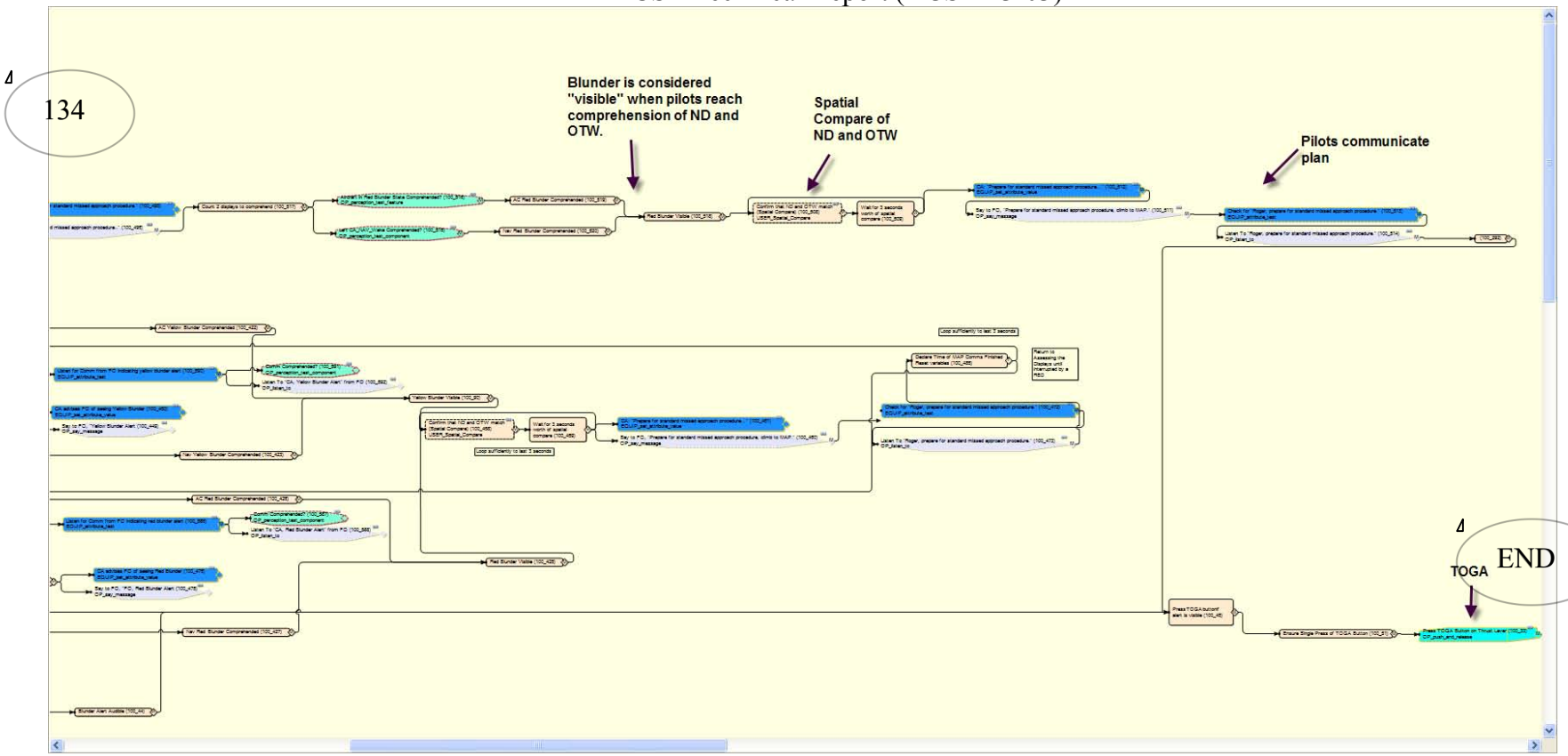


Figure 135. Pilot spatial compare requirement once alerted of blunder.

The Environment Model: Microsaint Sharp

The operator model and the associated procedures undertaken by the PF/CA and the PNF/FO are triggered by an environment model generated in a second Microsaint Sharp model that is fed into MIDAS through a socket communication protocol. This outside environment sends associated positional data to MIDAS that then uses the environmental positional information to trigger operator behavior (see Figure 136). An important task illustrated in Figure 136 is the network 375 termed "bandwidth generator". The bandwidth generator task will be described following Figure 136.

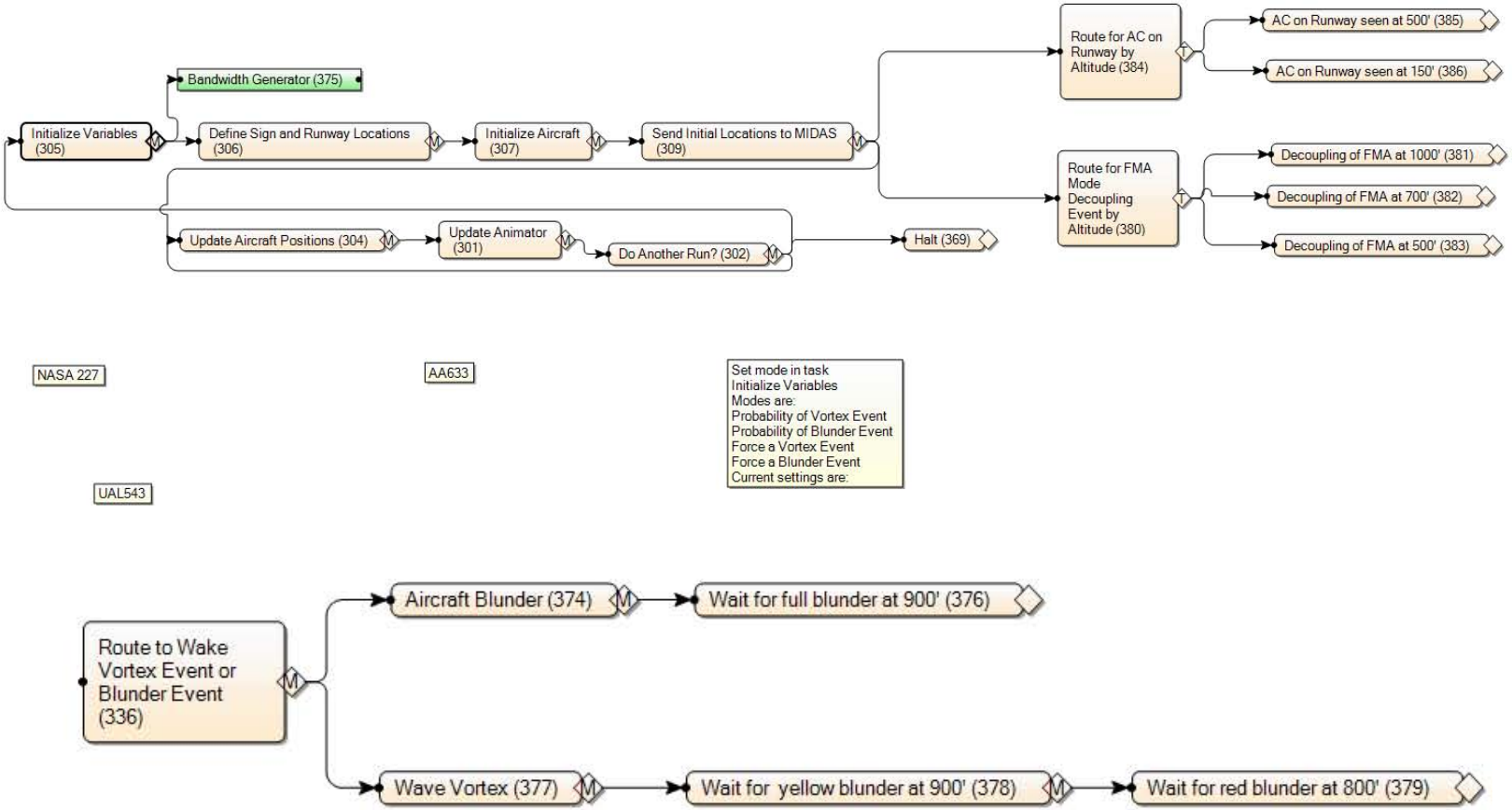


Figure 136. Environment model used to trigger the MIDAS operator model.

A task termed "Bandwidth generator" was used to generate information flow rates to trigger the MIDAS operator response for the different aircraft densities. A unique bandwidth loop for the ATC displays was required in the Microsaint Sharp model to repeatedly send over simulated information updates to the displays at regular intervals. This way, the displays updated frequently enough such that comprehension was not gained immediately. A new bandwidth generator called "ATC_Displays" sent a new value over Sharp Talk. This

value was sent under the name of "ATC_Displays" and updated any display whose attribute shared a situation element called "ATC_Displays." To make use of the bandwidth generators, the displays required such an attribute. The bandwidth generators were divided into four primary task sets; low, medium, high and every second. The low bandwidth generator tasks included route, terrain, terrain predictions, engine systems, datalink, weather, weather predicted, cabin systems, pireps, mcp and cdu. The medium bandwidth generator tasks included altitude, airspeed, groundspeed, route predicted, vertical speed, heading, breakout route, breakout route predicted, traffic, traffic predicted, wake. The high bandwidth generator tasks included aircraft pitch, bank, wake, angle of attack. The every second bandwidth generator tasks included the altitude that triggers context changes and the aircraft locations.

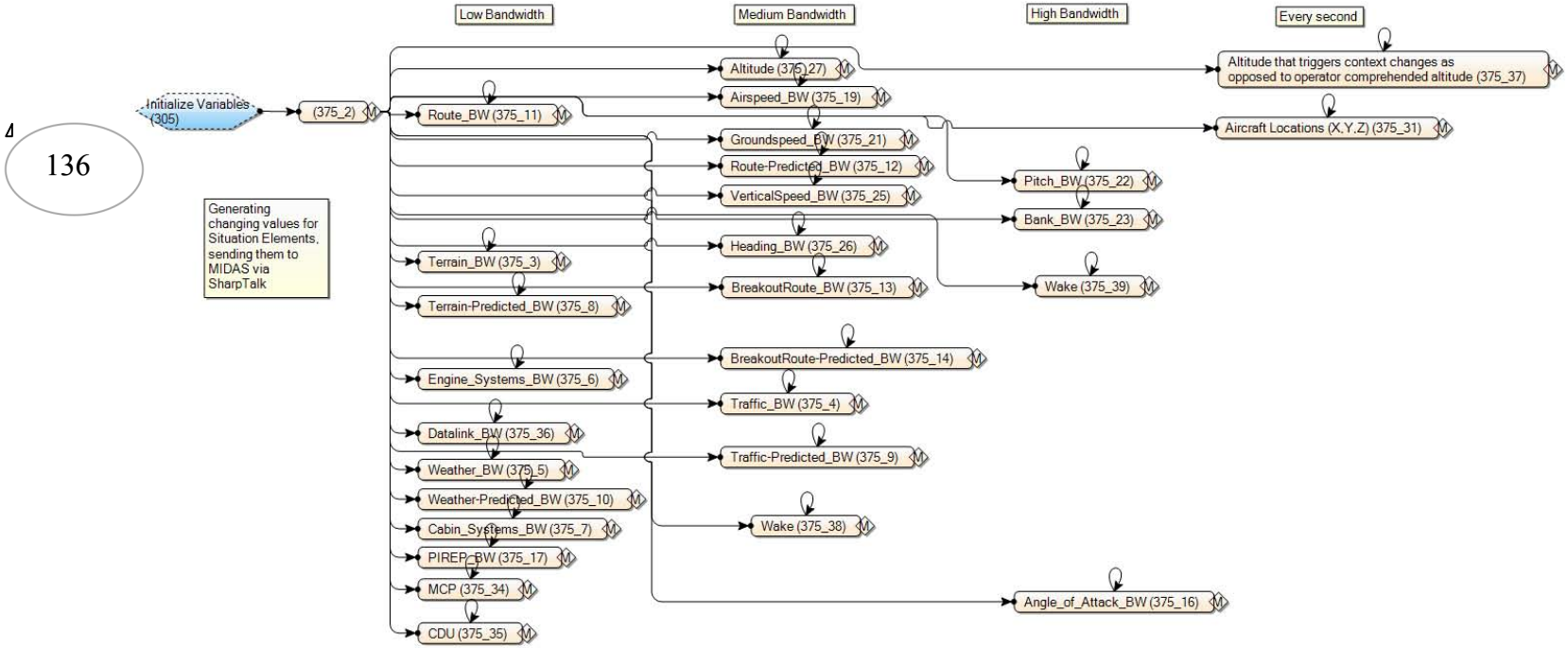


Figure 137. Bandwidth generator tasks (that include low, medium and high bandwidth components) used to drive information to the MIDAS operator model.

Under the Bandwidth Variables in the "Initialize Variables" task, new variables for the ATC Display bandwidth task were added.

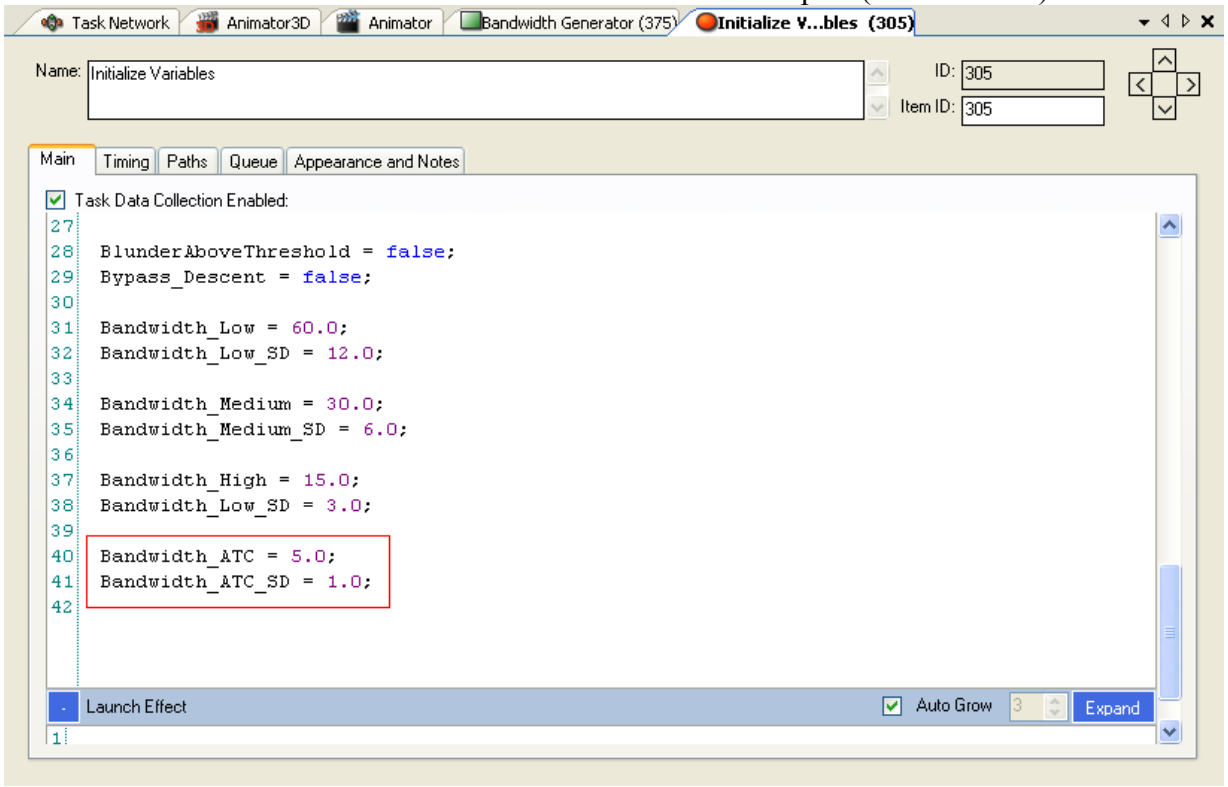


Figure 138. Settings in the initialization to use the bandwidth.

This required the following additional variables in the model (see Figure 139):

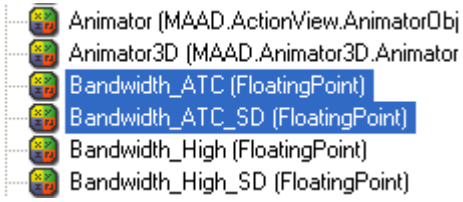


Figure 139. Variables that needed to be created to use the bandwidth generators.

In the ATC Responsible scenario, the controller must comprehend all three displays after which the controller had dialogue with the pilot, determined a MAP, re-checked the wake display and then either repeated this loop (if blunder is still yellow) or directed the pilots (if the blunder has turned red.). A loop that was similar to the pilots' yellow/red blunder loop was added for ATC in place of the more simplistic string of primitives in the model (Gore et al., 2009). Furthermore, this loop became its own procedure within the ATC task set (see Figure 140).

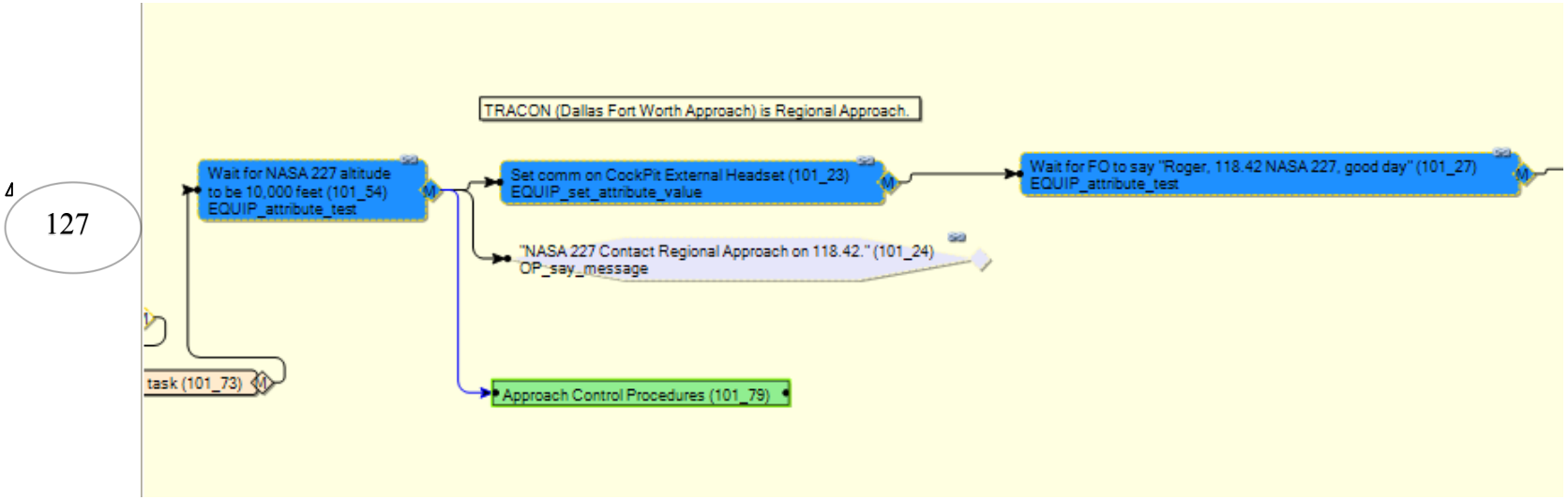


Figure 140. ATC responsible yellow/red alert tasks for the controller.

A definition line was added in the very first routing task of this procedure to define its release criteria to the approach type “ATC_Detect” (see Figure 141).

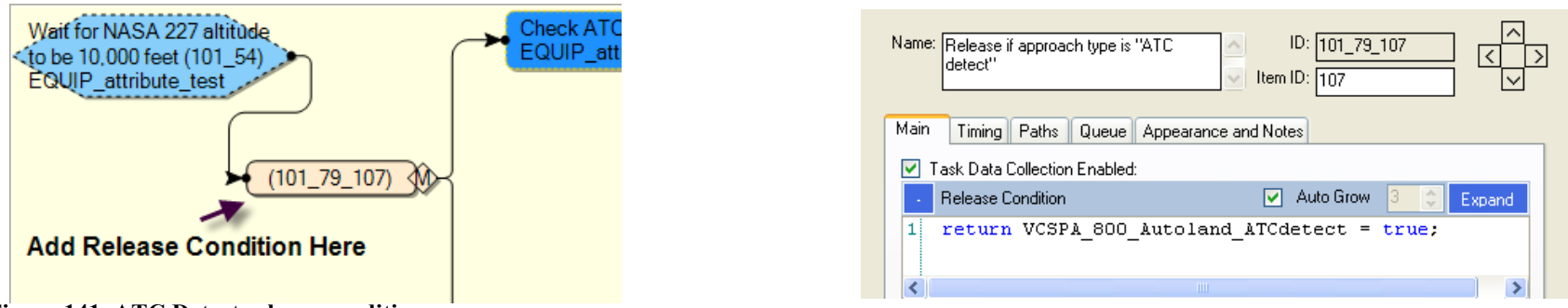


Figure 141. ATC Detect release condition.

Furthermore, all other activities with other controllers (approach control, tower) needed to be suspended in the event a red blunder does occur. For any entity going into the ATC Blunder procedure (which takes over in the event a blunder occurs), the entities were already assigned colors of yellow or red depending on the event. Upon a red blunder event, all aqua and yellow entities were suspended; only red entities continued (see Figure 142).

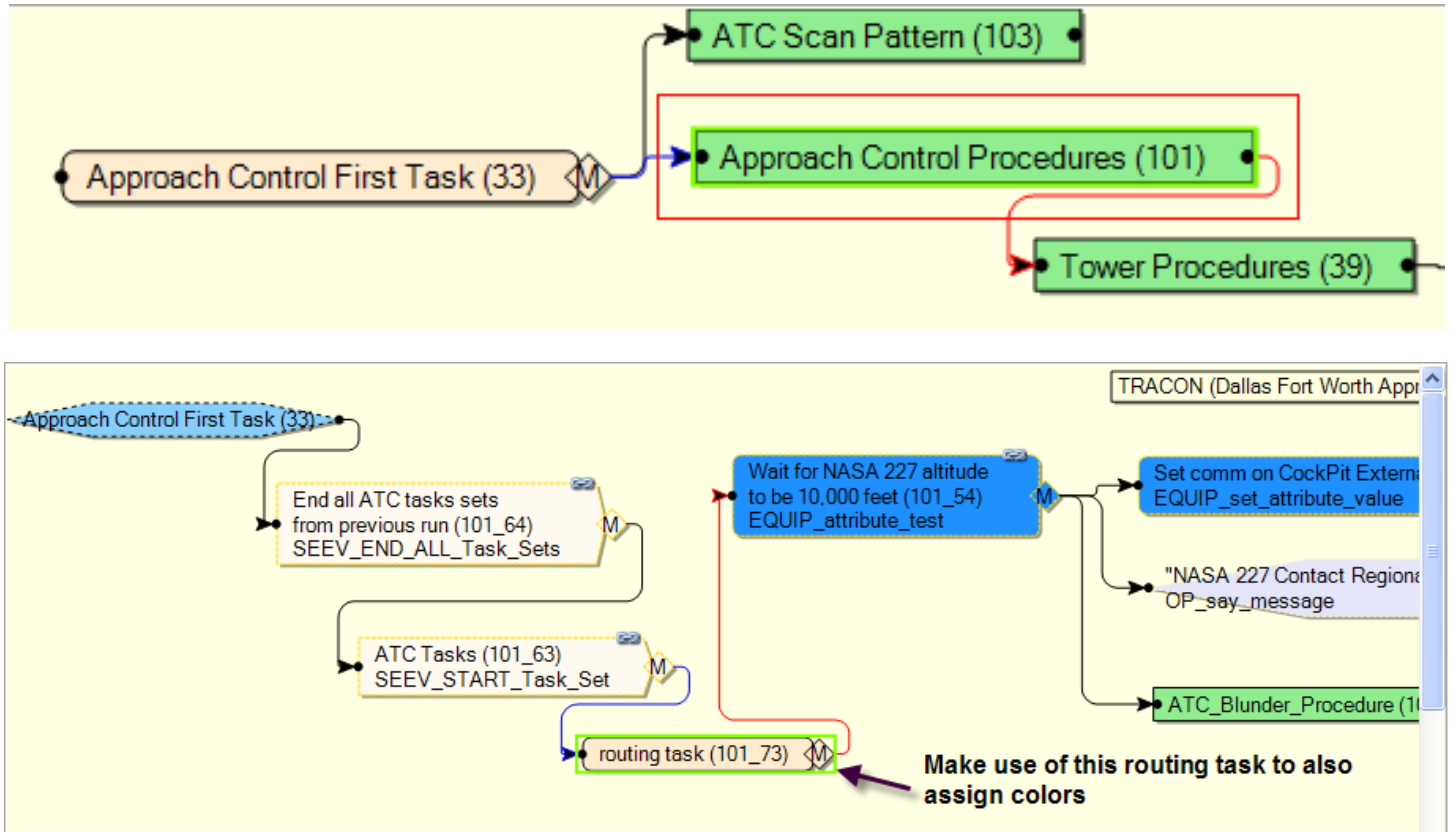


Figure 142. Routing task used to assign task colors to enable task tracking and to define suspend criteria.

The color “aqua” was assigned to these entities so they could be tracked as illustrated in Figure 143.

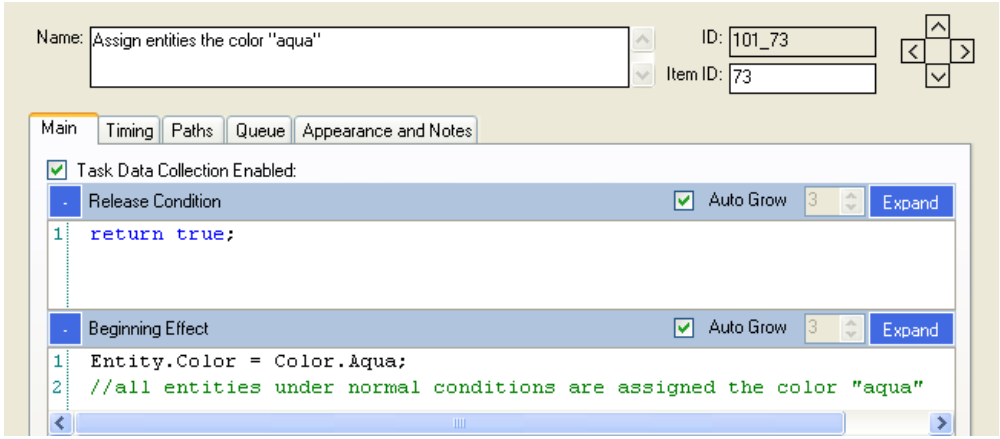


Figure 143. Assigning aqua color to tasks to enable task tracking.

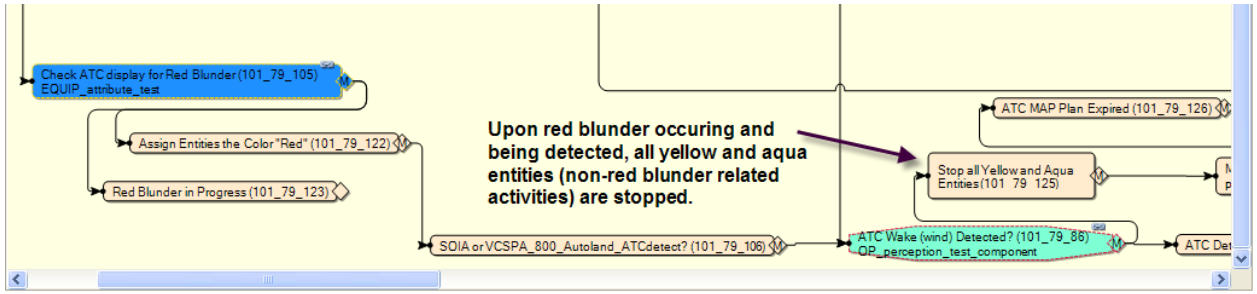


Figure 144. Criteria to stop all aqua and yellow entities.

The definitions required to suspend all non-blunder related entities when a red blunder event occurred can be found in Figure 145.

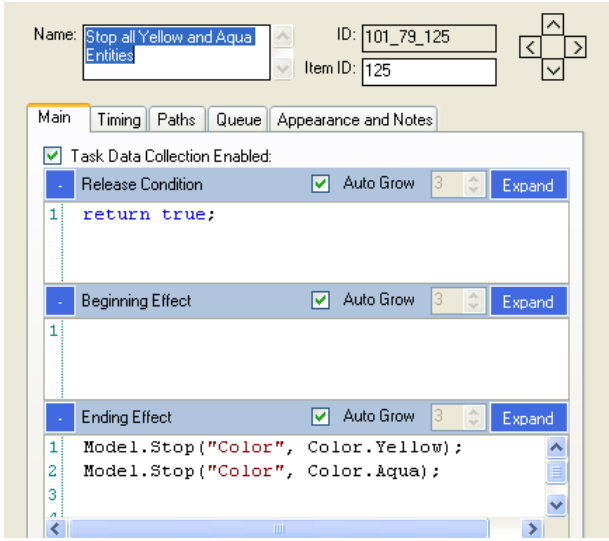


Figure 145. Definition required to suspend all non-blunder related entities when a red blunder event occurs.

The routing task 100_477 where the Captain had just detected the red blunder alert also needed to halt all entities of the other CA and FO ongoing tasks of color aqua and the subsequent requirement to stop the data collection (Figure 146, Figure 147).

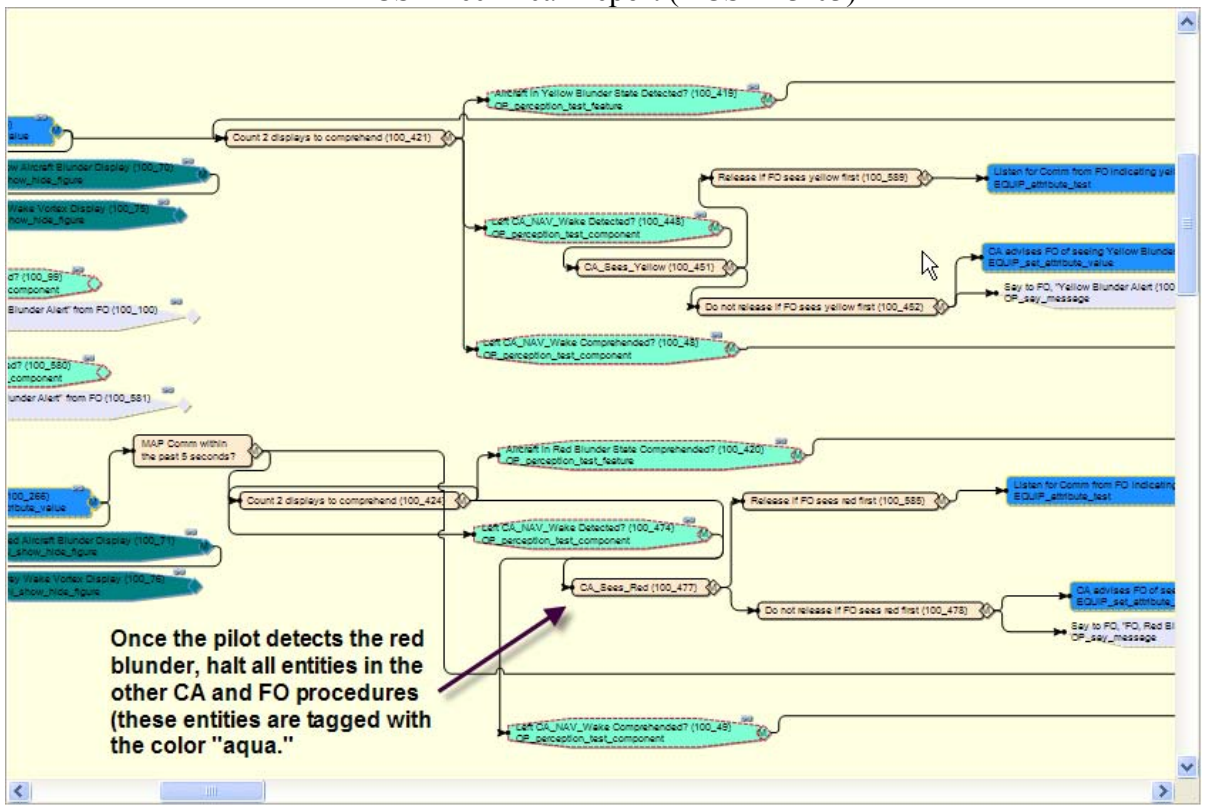


Figure 146. Halt all procedures other than the red blunder procedures.

Task Data Collection Enabled:

Release Condition — Auto Grow — Expand

```
1  return true;
```

Beginning Effect — Auto Grow — Expand

```
1  CA_Sees_Red = true;
2  Model.Stop("Color", Color.Aqua);
```

Figure 147. Definition to stop the data collection when the CA sees a red blunder event.

A similar setup was applied to the FO (see Figure 148). Whoever detects the red blunder first cause the suspension of all other non-blunder related activities.

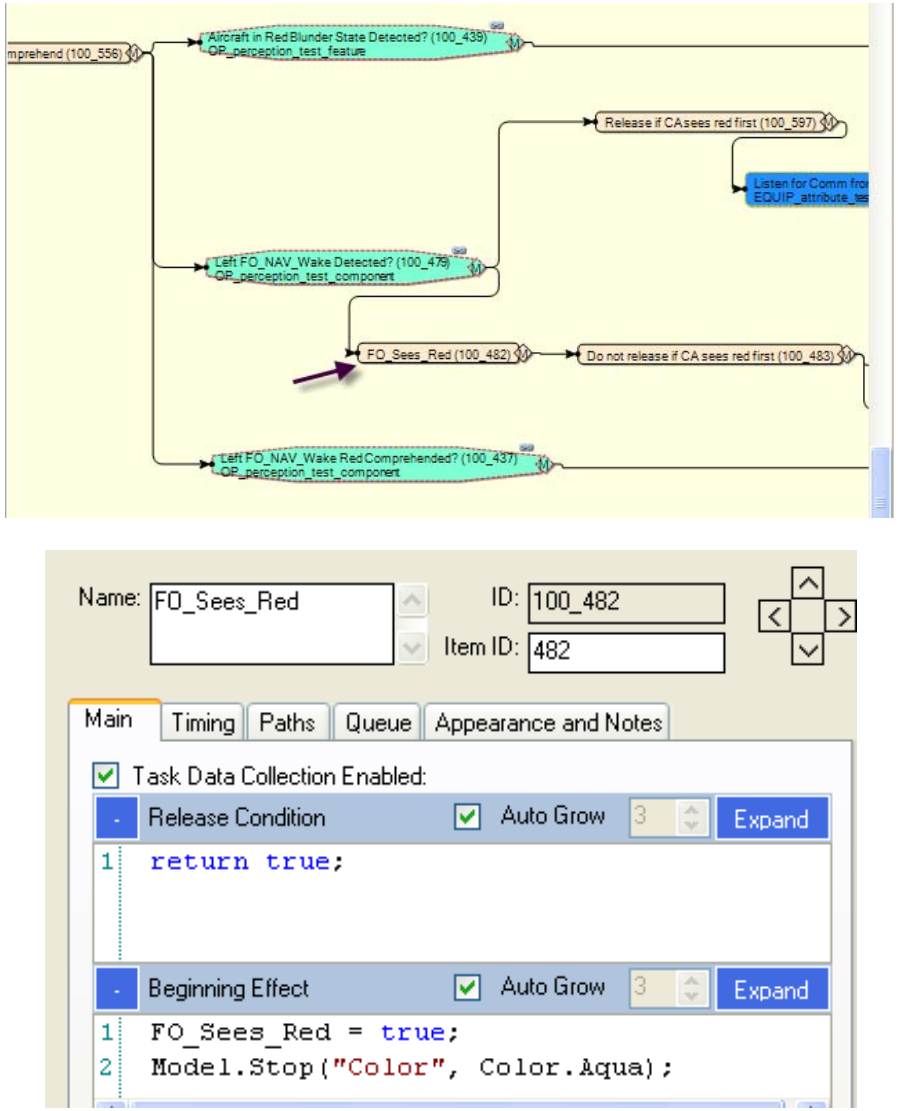


Figure 148. PNF/FO red blunder event detection tasks.

Reverse Engineering the Task Network Model

The task network model outputs many pieces of information throughout a run including all of the model settings and details, the simulated operator's performance, the environmental performance, the aircraft performance/track, the displays among a host of other model parameters and settings included in the scenario. As a result, it is often difficult to determine which human behavior tasks occurred during a simulation scenario by considering the raw data files. Reverse Engineering is a process used to clearly present only the relevant pilot tasks that occurred (that were "fired"/triggered) during a specific scenario and/or model run along a timeline. To clearly present the relevant data that occurred in the model scenario, the raw data was sorted and filtered to remove all non-operator based tasks (termed model routing tasks). The reverse engineered process culminated in only the operator-based tasks, thereby allowing a clear comparison between model scenarios (for instance, the RNAV no pair {current day baseline}, RNAV with pair {current day aircraft pairing}, the Very Closely Spaced Parallel Operations {VCSPO} with 200 ft breakout and 800 ft breakout) to determine procedural and task differences. All of the reverse engineered models can be located on pages 123 through 205, with a summary of the model differences listed on pages 206 and 207.

The Reverse Engineered Model

RNAV No Pair

Start Time	Context	Operator	Task ID	Task Description
0.2	default	ATC_Controller	101_63	ATC Tasks
0.2	descent	Captain	51_11	Autobrakes armed
0.2	descent	Captain	51_13	autobrakes level2
0.2	descent	Captain	51_2	Right MFD in Landing State (ND)
0.2	descent	Captain	51_28	speed is 200 knots Left PFD
0.2	descent	Captain	51_29	speed is 200 knots Right PFD
0.2	descent	Captain	92_3_4	Choose Scenario Type
1.2	descent	Captain	111_36	Auditory monitor
1.2	descent	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
6.2	default	ATC_Controller	101_54	Wait for NASA 227 altitude to be 10000 for 4 thousand
6.2	descent	First_Officer	48_29	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	descent	First_Officer	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6.2	descent	Captain	48_33	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	descent	Captain	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
8.4	default	ATC_Controller	101_24	"NASA 227 Contact Regional Approach on 118.42."
8.4	default	ATC_Controller	101_27	Wait for FO to say "NASA 227 switching. Good day."
8.4	descent	First_Officer	48_38	OP_say_message "NASA 227 switching. Good day."
9.8	descent	First_Officer	48_41	radio freq button
10.2	descent	First_Officer	48_42	OP_push_and_release
11	default	ATC_Controller	101_33	Wait for FO to radio "NASA 227 is with you at 10 thousand."
11	default	ATC_Controller	101_35	Say "Roger NASA 227 Dallas altimeter 29.85."
11	descent	First_Officer	48_37	OP_say_message "NASA 227 is with you at 10 thousand"
11	descent	First_Officer	48_43	Wait for "Roger NASA 227. Dallas altimeter 29.85" comm from ATC.
11	descent	First_Officer	48_44	OP_listen_to "Roger NASA 227, Dallas altimeer 29.85"
11	descent	Captain	48_47	Wait for "Roger NASA 227. Dallas altimeter 29.85" comm from ATC.
11	descent	Captain	48_48	OP_listen_to "Roger NASA 227, Dallas altimeer 29.85"
12.9	default	ATC_Controller	101_38	Say "NASA 227 Descend and maintain 4000 ft traffic on parallel is an XYZ 767."
12.9	default	ATC_Controller	101_51	Wait for FO to radio "NASA 227 Dallas altimeter 29.85"
12.9	descent	Captain	48_117	OP_listen_to "NASA 227 Descend and maintain 4000 ft, traffic on parallel is an America 767."
12.9	descent	Captain	48_67	Wait for "NASA 227 Descend and maintain 4000 ft Traffic on parallel is an XYZ 767."

12.9	descent	First_Officer	48_70	OP_listen_to "NASA 227, 29.85."
14.8	descent	First_Officer	48_118	OP_listen_to "NASA 227 Descend and maintain 4000 ft, traffic on parallel is an America 767."
14.8	descent	First_Officer	48_69	Wait for "NASA 227 Descend and maintain 4000 ft Traffic on parallel is an XYZ 767."
16.9	default	ATC_Controller	101_52	Wait for FO to radio "NASA 227 is leaving 10000 for 4 thousand.
16.9	descent	Captain	48_101	Wait for FO to say "NASA 227 is leaving 10000 for 4 thousand."
16.9	descent	Captain	48_102	OP_listen_to "NASA 227 is leaving 10,000 for 4 thousand."
16.9	descent	First_Officer	48_72	OP_say_message "NASA 227 is leaving 10,000 for 4 thousand."
18.9	descent	Captain	48_134	FLCH on MCP
21.6	descent	First_Officer	48_93	altitude knob to 4000
22.1	descent	First_Officer	48_94	USER_turn_dial
25.1	approach_initial	Captain	111_36	Auditory monitor
25.2	approach_initial	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
25.6	default	ATC_Controller	101_31	Say "NASA 227 descend to 1800 cleared"
25.6	default	ATC_Controller	101_55	Wait for NASA 227 altitude to be 4000 feet
26.2	approach_initial	First_Officer	3_125	Wait for ATC to say "NASA 227 descend to 1800 cleared"
26.2	approach_initial	Captain	3_126	Wait for ATC to say "NASA 227 descend to 1800 cleared"
26.2	approach_initial	Captain	3_127	Listen to Clearance
26.2	approach_initial	First_Officer	3_338	Wait for NASA 227 altitude to be 4000 feet
26.2	approach_initial	First_Officer	3_373	Listen to Clearance
26.2	approach_initial	Captain	3_522	Wait for NASA 227 altitude to be 4000 feet
29.7	default	ATC_Controller	101_53	Wait for FO to radio "NASA 227 leaving 4 for 2400. Cleared LA to 18R tower at NETEE."
29.7	approach_initial	First_Officer	3_10	NASA 227 leaving 4 for 2400. Cleared LDA to 18R. Tower at NETEE
29.7	approach_initial	First_Officer	3_374	Wait to Comprehend
30.2	approach_initial	Captain	3_324	Wait for FO to say "NASA 227 leaving 4 for 2400. cleared LDA to 18R, tower at NETEE."
30.2	approach_initial	Captain	3_325	Listen to Ack
33.3	approach_initial	Captain	3_348	Approach Mode Button on MCP
34.3	approach_initial	Captain	3_350	Reach speed dial
34.8	approach_initial	Captain	3_354	set speed
36.3	approach_initial	Captain	3_351	says "Flaps One"
36.3	approach_initial	Captain	3_503	Set CA PFD Speed to 180
36.3	approach_initial	Captain	3_504	Set FO PFD Speed to 180
37.7	approach_initial	Captain	3_505	Altitude < 2600
37.7	approach_initial	Captain	3_59	Call for Flaps 20
38.8	approach_initial	First_Officer	3_139	Wait to hear Flaps Command
38.8	approach_initial	First_Officer	3_469	OP_listen_to "flaps 20 command"
38.8	approach_initial	First_Officer	3_524	Altitude < 2600
42	approach_initial	First_Officer	3_140	Wait to Comprehend Flaps
42	approach_initial	First_Officer	3_60	Reach for Flaps

42.4	approach_initial	First_Officer	3_61	Set Flaps 20
42.9	approach_initial	Captain	3_141	Wait for "ack Flaps"
42.9	approach_initial	First_Officer	3_303	Set Flaps Level 20 on EICAS
42.9	approach_initial	Captain	3_468	OP_listen_to "ack Flaps"
42.9	approach_initial	First_Officer	3_62	Ack Flaps
43.4	approach_initial	First_Officer	3_62	Ack Flaps 20
46.9	approach_initial	Captain	3_142	Wait to Comprehend Flaps
46.9	approach_initial	First_Officer	3_145	Wait to hear gear down and final descent checklist
46.9	approach_initial	Captain	3_46	Call for "gear down and final decsent"
46.9	approach_initial	First_Officer	3_470	OP_listen_to "gear down and final descent"
51	approach_initial	First_Officer	3_146	Wait to Comprehend Gear Down and final descent checklist
51	approach_initial	First_Officer	3_147	Reach for Landing Gear Control
51.4	approach_initial	First_Officer	3_148	Set Landing Gear
52.2	approach_initial	First_Officer	3_560	Final Descent Checklist
52.5	approach_initial	First_Officer	3_557	3 items
53.4	approach_initial	First_Officer	3_551	Check List
56	approach_initial	First_Officer	3_550	Ack Notification
57.1	approach_initial	First_Officer	3_149	Ack Gear Down
57.1	approach_initial	First_Officer	3_152	Set Landing Gear Indicator
57.1	approach_initial	First_Officer	3_154	Wait for Landing Gear Indicator
57.1	approach_initial	Captain	3_156	Wait for FO Ack of Gear Down
57.1	approach_initial	Captain	3_467	OP_listen_to "FO Ack of Gear Down"
57.1	approach_initial	First_Officer	3_526	Update EICAS
57.1	approach_initial	First_Officer	3_553	Do for each check list item
61.1	approach_initial	Captain	3_157	Wait to Comprehend Headset
61.1	approach_initial	Captain	3_53	Reach speed dial
61.6	approach_initial	Captain	3_321	set speed
63.7	approach_initial	Captain	3_506	Set CA PFD Speed to 146
63.7	approach_initial	Captain	3_507	Set FO PFD Speed to 146
63.7	approach_initial	Captain	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
63.7	approach_initial	Captain	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
63.7	approach_initial	Captain	3_55	Call out Speed
64.6	approach_initial	Captain	3_248	speed brake
64.9	approach_initial	Captain	3_249	arm speed brake
65.5	approach_initial	Captain	3_511	Update EICAS
65.8	approach_initial	First_Officer	3_230	Wait for Flaps 25 request
65.8	approach_initial	Captain	3_253	Command Flaps 25
65.8	approach_initial	Captain	3_254	checklist done?
69.9	approach_initial	First_Officer	3_259	Flaps Control (OP_reach_object)

70.2	approach_initial	First_Officer	3_257	Flaps Control (OP_push_and_release)
70.8	approach_initial	First_Officer	3_231	Ack Flaps 25
70.8	approach_initial	Captain	3_274	ConfirmFlaps 25
70.8	approach_initial	Captain	3_512	Wait for EICAS to display flaps 25
70.8	approach_initial	First_Officer	3_527	Set Flaps 25 on Upper EICAS
71.2	approach_initial	Captain	3_261	Command Flaps 30
71.2	approach_initial	First_Officer	3_265	Wait for Flaps 30 request
75.4	approach_initial	First_Officer	3_269	Flaps Control (OP_reach_object)
75.7	approach_initial	First_Officer	3_267	Flaps Control (OP_push_and_release)
76.3	approach_initial	First_Officer	3_266	Ack Flaps 30
76.3	approach_initial	First_Officer	3_273	radio freq control (OP_reach_object)
76.3	approach_initial	Captain	3_276	ConfirmFlaps 30
76.3	approach_initial	Captain	3_513	Wait for EICAS to display flaps 30
76.3	approach_initial	First_Officer	3_528	Set Flaps 30 on Upper EICAS
76.6	approach_initial	First_Officer	3_271	radio freq control (OP_push_and_release)
77.5	approach_initial	First_Officer	3_279	Tower Nasa 227 NETEE for one-eight-right.
81.1	approach_initial	First_Officer	3_280	Listen to "NASA 227 cleared to land on one-eight-right."
81.1	approach_initial	First_Officer	3_360	Wait for Tower to say "NASA 227 cleared to land on one-eight-right."
81.1	approach_initial	Captain	3_379	Wait for Tower to say "NASA 227 cleared to land on one-eight-right."
81.1	approach_initial	Captain	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
81.1	default	ATC_Controller	39_37	Wait for comm from crew "Tower NASA 227 NETEE for one-eight-right Traffic and runway in sight."
81.1	default	ATC_Controller	39_38	Say "NASA 227 cleared to land on one-eight-right."
83.3	approach_initial	First_Officer	3_281	FO repiles "Roger NASA 227 cleared to land on one-eight-right"
83.3	default	ATC_Controller	39_49	Wait for comm from crew "Roger NASA 227 cleared to land on one-eight-right."
92.8	approach_transitional_1	Captain	92_26_4	Choose Scenario Type
93.2	approach_transitional_1	First_Officer	3_564	Altitude < 1800
93.2	approach_transitional_1	First_Officer	3_567	Reach CDU
93.4	approach_transitional_1	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
93.5	approach_transitional_1	First_Officer	3_565	Set Touchdown Elevation
93.8	approach_transitional_1	Captain	111_36	Auditory monitor
122.9	approach_transitional_1	Captain	3_568	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	First_Officer	3_569	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	Captain	3_571	Altitude < 1400
122.9	approach_transitional_1	First_Officer	3_572	Altitude < 1400
146.4	approach_transitional_2	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
146.8	approach_transitional_2	Captain	111_36	Auditory monitor
153.8	approach_transitional_2	First_Officer	3_538	Altitude on PFD < 1000
160.8	approach_transitional_2	Captain	3_519	Altitude < 900

160.8	approach_transitional_2	Captain	3_520	Alert on EICAS (distraction of low salience)
160.8	approach_transitional_2	First_Officer	3_533	Altitude < 900
160.8	approach_transitional_2	First_Officer	3_534	Alert on EICAS (distraction of low salience)
162.2	approach_initial	First_Officer	3_85	Call out 1000 feet - Instruments Cross Checked
168.8	approach_final	Captain	3_492	Maintain Runway Alignment - CA
168.8	approach_final	First_Officer	3_494	Maintain Runway Alignment - FO
168.8	approach_transitional_2	Captain	3_515	Altitude < 800
168.8	approach_transitional_2	First_Officer	3_530	Altitude < 800
168.8	approach_final	Captain	92_27_4	Choose Scenario Type
168.8	approach_final	Captain	97_116	Acquire Runway - CA
168.8	approach_final	Captain	97_157	800 ft Cloud
168.8	approach_final	First_Officer	97_163	800 ft Cloud
169.4	approach_final	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
169.8	approach_final	Captain	111_36	Auditory monitor
172.8	approach_final	First_Officer	3_425	Approaching Decision Height comm from FO to Captain
172.8	approach_final	Captain	3_427	Wait for internal comms Approaching Decision Height
172.8	approach_final	Captain	3_464	OP_listen_to internal comms Approaching Decision Height
172.8	approach_final	Captain	3_516	Altitude < 750 (100' above DH)
172.8	approach_final	First_Officer	3_531	Altitude < 750 (100' above DH)
179.7	land_initial	Captain	3_492	Maintain Runway Alignment - CA
179.7	land_initial	First_Officer	3_494	Maintain Runway Alignment - FO
179.7	approach_final	First_Officer	3_575	Altitude < 650
179.7	approach_final	Captain	3_576	Altitude < 650
179.7	land_initial	Captain	52_182	Altitude < 650
179.7	land_initial	Captain	52_183	Turn off autopilot
179.7	land_initial	First_Officer	52_211	Runway Detected?
179.7	land_initial	First_Officer	52_212	Altitude < 650
179.7	land_initial	First_Officer	52_214	Call out "Runway in sight"
179.8	land_initial	Captain	111_36	Auditory monitor
180.4	land_initial	Captain	3_363	Wait for internal comms to be runway in sight
180.4	land_initial	Captain	3_463	OP_listen_to internal comms to be runway in sight
180.4	land_initial	Captain	52_184	autopilot alarm sounds
180.4	land_initial	Captain	52_206	Wait for internal comms to be runway in sight
180.4	land_initial	Captain	52_207	OP_listen_to internal comms to be runway in sight
180.4	land_initial	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
180.7	land_initial	Captain	52_186	Silence Alarm
181.4	land_initial	Captain	52_13	Trim and then Steer
181.4	land_initial	Captain	52_15	throttle
182.4	land_initial	Captain	52_60	Spatial Comparison of Runway by OS

182.5	land_initial	Captain	3_361	Calls out Runway in Sight - Landing
182.5	default	ATC_Controller	39_68	Wait for comm from crew "NASA 227 has runway 18R in sight."
182.5	land_initial	First_Officer	52_220	Final Descent Checklist complete
182.9	land_initial	Captain	52_12	Apply Rudder
183.3	default	ATC_Controller	39_58	Calculate distance between ownship and intersection of 18R and E6.
183.5	default	ATC_Controller	39_47	Say "NASA 227 left turn on West Mike. Hold short of one-eight-left."
184.1	land_initial	Captain	3_561	Wait for internal comm Final Descent Checklist complete
184.1	land_initial	Captain	3_563	OP_listen_to internal comm Final Descent Checklist complete
185.7	land_initial	Captain	3_562	Confirm Roger Final Descent Checklist complete
191.8	land_initial	Captain	52_236	Wait for automated comm 500 feet
191.8	land_initial	Captain	52_238	OP_listen_to automated comm 500 feet
191.8	land_initial	Captain	52_239	Altitude < 500
191.8	land_initial	First_Officer	52_242	Altitude < 500
191.8	land_initial	First_Officer	52_244	OP_listen_to altitude < 500
192.2	land_initial	First_Officer	52_245	double check EICAS to ensure flaps 30
192.2	land_initial	First_Officer	52_246	ConfirmFlaps 30
192.6	land_initial	Captain	52_240	Final Flaps 30
214.8	land_final	Captain	52_13	Trim and then Steer
214.8	land_final	Captain	52_15	throttle
214.8	land_final	Captain	97_154	200 ft Cloud
214.8	land_final	First_Officer	97_166	200 ft Cloud
214.9	land_final	Captain	3_492	Maintain Runway Alignment - CA
214.9	land_final	First_Officer	3_494	Maintain Runway Alignment - FO
215.4	land_final	First_Officer	67_3	Scan Pattern OP_auditory_monitor loop
215.7	land_final	Captain	111_36	Auditory monitor
216.1	land_final	Captain	52_12	Apply Rudder
221.8	land_final	First_Officer	52_114	Call out 100 feet
221.8	land_final	First_Officer	52_115	Altitude < 100
221.8	land_final	Captain	52_121	Altitude < 100
221.8	land_final	Captain	52_122	Listen to FO's 100' callout
225.8	land_final	Captain	52_39	Altitude < 50 feet
225.8	land_final	Captain	52_40	Flare
225.8	land_final	First_Officer	52_50	Altitude < 50
225.8	land_final	First_Officer	52_52	OP_listen_to altitude < 50
226.8	land_final	First_Officer	52_53	Altitude < 30
226.8	land_final	First_Officer	52_55	OP_listen_to altitude < 30
228.6	land_final	First_Officer	52_56	Altitude < 10
228.6	land_final	First_Officer	52_58	OP_listen_to altitude < 10

RNAV With Pair

Start Time	Context	Operator	Task ID	Task Description
0.2	default	ATC_Controller	101_63	ATC Tasks
0.2	descent	Captain	51_11	Autobrakes armed
0.2	descent	Captain	51_13	autobrakes level2
0.2	descent	Captain	51_2	Right MFD in Landing State (ND)
0.2	descent	Captain	51_28	speed is 200 knots Left PFD
0.2	descent	Captain	51_29	speed is 200 knots Right PFD
1.2	descent	Captain	111_36	Auditory monitor
1.2	descent	First_Officer	67_3	OP_auditory_monitor
6.2	default	ATC_Controller	101_24	NASA 227 Contact Regional Approach on 118.42.
6.2	descent	First_Officer	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6.2	descent	Captain	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6.2	descent	First_Officer	48_29	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	descent	Captain	48_33	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	default	ATC_Controller	101_54	Wait for NASA 227 altitude to be 10
8.4	descent	First_Officer	48_38	OP_say_message "NASA 227 switching good day"
8.4	default	ATC_Controller	101_27	Wait for FO to say "NASA 227 switching. good day."
9.8	descent	First_Officer	48_41	radio freq button
10.2	descent	First_Officer	48_42	OP_push_and_release
11	descent	First_Officer	48_44	OP_listen_to "Roger. NASA 227. Dallas altimeter 29.85"
11	descent	Captain	48_48	OP_listen_to "Roger. NASA 227. Dallas altimeter 29.85"
11	descent	First_Officer	48_37	OP_say_message "NASA 227 is with you at 10 thousand
11	default	ATC_Controller	101_35	Say "Roger NASA 227
11	descent	First_Officer	48_43	Wait for "Roger
11	descent	Captain	48_47	Wait for "Roger
11	default	ATC_Controller	101_33	Wait for FO to radio "NASA 227 is with you at 10 thousand."
12.9	descent	Captain	48_117	OP_listen_to "NASA 227 Descend and maintain 4000 ft traffic on parallel is an XYZ 767."
12.9	descent	First_Officer	48_70	OP_listen_to "NASA 227, 29.85."
12.9	default	ATC_Controller	101_38	Say "NASA 227 Descend and maintain 4000 ft
12.9	descent	Captain	48_67	Wait for "NASA 227 Descend and maintain 4000 ft
12.9	default	ATC_Controller	101_51	Wait for FO to radio "NASA 227
14.8	descent	First_Officer	48_118	OP_listen_to "NASA 227 Descend and maintain 4000 ft traffic on parallel is an XYZ 767."
14.8	descent	First_Officer	48_69	Wait for "NASA 227 Descend and maintain 4000 ft
16.9	descent	Captain	48_102	OP_listen_to "NASA 227 is leaving 10,000 for 4 thousand."
16.9	descent	First_Officer	48_72	OP_say_message "NASA 227 is leaving 10,000 for 4 thousand, offset ILS to 18R, following XYZ 633 by 20-30 seconds
16.9	default	ATC_Controller	101_52	Wait for FO to radio "NASA 227 is leaving 10
16.9	descent	Captain	48_101	Wait for FO to say "NASA 227 is leaving 10

18.9	descent	Captain	48_134	FLCH on MCP
21.6	descent	First_Officer	48_93	altitude knob
22.1	descent	First_Officer	48_94	USER_turn_dial
25.1	approach_initial	Captain	111_36	Auditory monitor
25.2	approach_initial	First_Officer	67_3	OP_auditory_monitor
25.6	default	ATC_Controller	101_31	Say "NASA 227 descend to 2400. Cleared LDA to 18R. Contact tower at NETEE on 124.15."
25.6	default	ATC_Controller	101_55	Wait for NASA 227 altitude to be 4
26.2	approach_initial	Captain	3_127	Listen to Clearance
26.2	approach_initial	First_Officer	3_373	Listen to Clearance
26.2	approach_initial	First_Officer	3_125	Wait for ATC to say "NASA 227 descend to 2400. Cleared LDA to 18R. Contact tower at NETEE on 124.15."
26.2	approach_initial	Captain	3_126	Wait for ATC to say "NASA 227 descend to 2400. Cleared LDA to 18R. Contact tower at NETEE on 124.15."
26.2	approach_initial	First_Officer	3_338	Wait for NASA 227 altitude to be 4
26.2	approach_initial	Captain	3_522	Wait for NASA 227 altitude to be 4
29.7	approach_initial	First_Officer	3_10	NASA 227 leaving 4 for 2400
29.7	default	ATC_Controller	101_53	Wait for FO to radio "NASA 227 leaving 4 for 2400
29.7	approach_initial	First_Officer	3_374	Wait to Comprehend
30.2	approach_initial	Captain	3_325	Listen to Ack
30.2	approach_initial	Captain	3_324	Wait for FO to say "NASA 227 leaving 4 for 2400
33.3	approach_initial	Captain	3_348	Approach Mode Button on MCP
34.3	approach_initial	Captain	3_350	Reach speed dial
34.8	approach_initial	Captain	3_354	set speed
36.3	approach_initial	Captain	3_351	Flaps One
36.3	approach_initial	Captain	3_503	Set CA PFD Speed to 180
36.3	approach_initial	Captain	3_504	Set FO PFD Speed to 180
37.7	approach_initial	Captain	3_505	Altitude < 2600
37.7	approach_initial	Captain	3_59	Call for Flaps 20
38.8	approach_initial	First_Officer	3_524	Altitude < 2600
38.8	approach_initial	First_Officer	3_139	Wait to hear Flaps Command
38.8	approach_initial	First_Officer	3_469	OP_listen_to flaps command
42	approach_initial	First_Officer	3_60	Reach for Flaps
42	approach_initial	First_Officer	3_140	Wait to Comprehend Flaps
42.4	approach_initial	First_Officer	3_61	Set Flaps
42.9	approach_initial	First_Officer	3_62	Ack Flaps
42.9	approach_initial	Captain	3_468	OP_listen_to ack Flaps
42.9	approach_initial	First_Officer	3_303	Set Flaps Level on EICAS
42.9	approach_initial	Captain	3_141	Wait for "ack Flaps"
43.4	approach_initial	First_Officer	3_62	Ack Flaps
46.9	approach_initial	Captain	3_46	Call for "gear down and final decsent"

46.9	approach_initial	First_Officer	3_470	OP_listen_to gear down and final descent
46.9	approach_initial	Captain	3_142	Wait to Comprehend Flaps
46.9	approach_initial	First_Officer	3_145	Wait to hear gear down and final descent checklist
51	approach_initial	First_Officer	3_147	Reach for Landing Gear Control
51	approach_initial	First_Officer	3_146	Wait to Comprehend Gear Down and final descent checklist
51.4	approach_initial	First_Officer	3_148	Set Landing Gear
52.2	approach_initial	First_Officer	3_560	Final Descent Checklist
52.5	approach_initial	First_Officer	3_557	3 items
53.4	approach_initial	First_Officer	3_551	Check List
55.7	approach_initial	First_Officer	3_552	Verify
56	approach_initial	First_Officer	3_550	Ack Notification
57.1	approach_initial	First_Officer	3_149	Ack Gear Down
57.1	approach_initial	First_Officer	3_553	Do for each check list item
57.1	approach_initial	Captain	3_467	OP_listen_to Ack of Gear Down
57.1	approach_initial	First_Officer	3_152	Set Landing Gear Indicator
57.1	approach_initial	First_Officer	3_526	Update EICAS
57.1	approach_initial	Captain	3_156	Wait for FO Ack of Gear Down
57.1	approach_initial	First_Officer	3_154	Wait for Landing Gear Indicator
61.1	approach_initial	Captain	3_53	Reach speed dial
61.1	approach_initial	Captain	3_157	Wait to Comprehend Headset
61.6	approach_initial	Captain	3_321	set speed
63.7	approach_initial	Captain	3_55	Call out Speed
63.7	approach_initial	Captain	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
63.7	approach_initial	Captain	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
63.7	approach_initial	Captain	3_506	Set CA PFD Speed to 146
63.7	approach_initial	Captain	3_507	Set FO PFD Speed to 146
64.6	approach_initial	Captain	3_248	speed brake
64.9	approach_initial	Captain	3_249	arm speed brake
65.5	approach_initial	Captain	3_511	Update EICAS
65.8	approach_initial	Captain	3_254	checklist done?
65.8	approach_initial	Captain	3_253	Command Flaps 25
65.8	approach_initial	First_Officer	3_230	Wait for Flaps 25 request
69.9	approach_initial	First_Officer	3_259	Flaps Control
70.2	approach_initial	First_Officer	3_257	Flaps Control
70.8	approach_initial	First_Officer	3_231	Ack Flaps 25
70.8	approach_initial	Captain	3_274	ConfirmFlaps 25
70.8	approach_initial	First_Officer	3_527	Set Flaps Level on Upper EICAS
70.8	approach_initial	Captain	3_512	Wait for EICAS to display flaps 25
71.2	approach_initial	Captain	3_261	Command Flaps 30

71.2	approach_initial	First_Officer	3_265	Wait for Flaps 30 request
75.4	approach_initial	First_Officer	3_269	Flaps Control
75.7	approach_initial	First_Officer	3_267	Flaps Control
76.3	approach_initial	First_Officer	3_266	Ack Flaps 30
76.3	approach_initial	Captain	3_276	ConfirmFlaps 30
76.3	approach_initial	First_Officer	3_273	radio freq control
76.3	approach_initial	First_Officer	3_528	Set Flaps Level on Upper EICAS
76.3	approach_initial	Captain	3_513	Wait for EICAS to display flaps 30
76.6	approach_initial	First_Officer	3_271	radio freq control
77.5	approach_initial	First_Officer	3_279	Tower
81.1	approach_initial	First_Officer	3_280	Listen to
81.1	approach_initial	Captain	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
81.1	default	ATC_Controller	39_38	Say "NASA 227 cleared to land on one-eight-right."
81.1	default	ATC_Controller	39_37	Wait for comm from crew "Tower
81.1	approach_initial	First_Officer	3_360	Wait for Tower to say
81.1	approach_initial	Captain	3_379	Wait for Tower to say
83.3	default	ATC_Controller	39_49	Wait for comm from crew "Roger
85.8	approach_initial	First_Officer	3_281	FO replies
93.2	approach_transitional_1	First_Officer	3_564	Altitude < 1800
93.2	approach_transitional_1	First_Officer	3_567	Reach CDU
93.4	approach_transitional_1	First_Officer	67_3	OP_auditory_monitor
93.5	approach_transitional_1	First_Officer	3_565	Set Touchdown Elevation
93.8	approach_transitional_1	Captain	111_36	Auditory monitor
122.9	approach_transitional_1	Captain	3_568	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	First_Officer	3_569	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	Captain	3_571	Altitude < 1400
122.9	approach_transitional_1	First_Officer	3_572	Altitude < 1400
153.8	approach_transitional_2	First_Officer	3_538	Altitude on PFD < 1000
160.8	approach_transitional_2	Captain	3_520	Alert on EICAS (distraction of low salience)
160.8	approach_transitional_2	First_Officer	3_534	Alert on EICAS (distraction of low salience)
160.8	approach_transitional_2	Captain	3_519	Altitude < 900
160.8	approach_transitional_2	First_Officer	3_533	Altitude < 900
162.2	approach_transitional_2	First_Officer	3_85	Call out 10000
168.8	approach_final	Captain	97_157	800 ft Cloud
168.8	approach_final	First_Officer	97_163	800 ft Cloud
168.8	approach_final	First_Officer	3_455	XYZ 633 Detected?
168.8	approach_final	Captain	97_116	Acquire Runway - CA
168.8	approach_transitional_2	Captain	3_514	Altitude < 800
168.8	approach_transitional_2	Captain	3_515	Altitude < 800

168.8	approach_transitional_2	First_Officer	3_529	Altitude < 800
168.8	approach_transitional_2	First_Officer	3_530	Altitude < 800
168.8	approach_final	Captain	3_492	Maintain Runway Alignment - CA
168.8	approach_final	First_Officer	3_494	Maintain Runway Alignment - FO
168.8	approach_final	First_Officer	3_490	Track Lead AC - CA
169.4	approach_final	First_Officer	67_3	OP_auditory_monitor
169.8	approach_final	Captain	111_36	Auditory monitor
172.8	approach_final	Captain	3_516	Altitude < 750 (100' above DH)
172.8	approach_final	First_Officer	3_531	Altitude < 750 (100' above DH)
172.8	approach_final	First_Officer	3_425	Approaching Decision Height comm from FO to Captain
172.8	approach_final	Captain	3_464	OP_listen_to Approaching decision height
172.8	approach_final	Captain	3_427	Wait for internal comms Approaching Decision Height
179.7	approach_final	First_Officer	3_575	Altitude < 650
179.7	approach_final	Captain	3_576	Altitude < 650
179.7	land_initial	Captain	52_182	Altitude < 650
179.7	land_initial	First_Officer	52_212	Altitude < 650
179.7	land_initial	First_Officer	52_214	Call out "Runway in sight"
179.7	land_initial	Captain	3_492	Maintain Runway Alignment - CA
179.7	land_initial	First_Officer	3_494	Maintain Runway Alignment - FO
179.7	land_initial	First_Officer	52_211	Runway Detected?
179.7	land_initial	First_Officer	3_490	Track Lead AC - CA
179.7	land_initial	Captain	52_183	Turn off autopilot
179.8	land_initial	Captain	111_36	Auditory monitor
180.4	land_initial	Captain	52_184	autopilot alarm sounds
180.4	land_initial	First_Officer	67_3	OP_auditory_monitor
180.4	land_initial	Captain	3_463	OP_listen_to runway in sight
180.4	land_initial	Captain	52_207	OP_listen_to runway in sight
180.4	land_initial	Captain	3_363	Wait for internal comms to be runway in sight
180.4	land_initial	Captain	52_206	Wait for internal comms to be runway in sight
180.7	land_initial	Captain	52_186	Silence Alarm
181.4	land_initial	Captain	52_15	throttle
181.4	land_initial	Captain	52_13	Trim and then Steer
182.4	land_initial	Captain	52_60	Spatial Comparison of Runway by OS
182.5	land_initial	Captain	3_361	Calls out Runway in Sight - Landing
182.5	land_initial	Captain	52_210	Calls out Runway in Sight - Landing
182.5	land_initial	First_Officer	52_220	Final Descent Checklist complete
182.5	default	ATC_Controller	39_71	Say "NASA 227
182.5	land_initial	First_Officer	52_218	Tell Tower "NASA 227 has runway 18R in sight."
182.5	land_initial	First_Officer	52_217	Tell Tower NASA 227 has runway in sight

182.5	land_initial	First_Officer	52_216	wait for CA to confirm runway in sight
182.5	default	ATC_Controller	39_68	Wait for comm from crew "NASA 227 has runway 18R in sight."
182.5	land_initial	First_Officer	52_219	Wait for Tower to say
182.9	land_initial	Captain	52_12	Apply Rudder
183.3	default	ATC_Controller	39_58	Calculate distance between ownship and intersection of 18R and E6.
183.5	default	ATC_Controller	39_47	Say "NASA 227 left turn on West Mike. Hold short of one-eight-left."
184.1	land_initial	Captain	3_563	OP_listen_to Final Descent Checklist complete
184.1	land_initial	Captain	3_561	Wait for internal comm Final Descent Checklist complete
185.7	land_initial	Captain	3_562	Confirm Roger Final Descent Checklist complete
191.8	land_initial	Captain	52_239	Altitude < 500
191.8	land_initial	First_Officer	52_242	Altitude < 500
191.8	land_initial	Captain	52_238	OP_listen_to automated comm 500 feet
191.8	land_initial	First_Officer	52_244	OP_listen_to headset 500 feet
191.8	land_initial	Captain	52_236	Wait for automated comm 500 feet
192.2	land_initial	First_Officer	52_246	ConfirmFlaps 30
192.2	land_initial	First_Officer	52_245	double check EICAS to ensure flaps 30
192.6	land_initial	Captain	52_240	Final Flaps 30
214.8	land_final	Captain	97_154	200 ft Cloud
214.8	land_final	First_Officer	97_166	200 ft Cloud
214.8	land_final	Captain	52_15	throttle
214.8	land_final	Captain	52_13	Trim and then Steer
214.9	land_final	Captain	3_492	Maintain Runway Alignment - CA
214.9	land_final	First_Officer	3_494	Maintain Runway Alignment - FO
214.9	land_final	First_Officer	3_490	Track Lead AC - CA
215.4	land_final	First_Officer	67_3	OP_auditory_monitor
215.7	land_final	Captain	111_36	Auditory monitor
216.1	land_final	Captain	52_12	Apply Rudder
221.8	land_final	First_Officer	52_115	Altitude < 100
221.8	land_final	Captain	52_121	Altitude < 100
221.8	land_final	First_Officer	52_114	Call out 100 feet
221.8	land_final	Captain	52_122	Listen to FO's 100' callout
225.8	land_final	First_Officer	52_50	Altitude < 50
225.8	land_final	Captain	52_39	Altitude < 50 feet
225.8	land_final	Captain	52_40	Flare
225.8	land_final	First_Officer	52_52	OP_listen_to headset 50 feet
226.8	land_final	First_Officer	52_53	Altitude < 30
226.8	land_final	First_Officer	52_55	OP_listen_to headset 30 feet
228.6	land_final	First_Officer	52_56	Altitude < 10
228.6	land_final	First_Officer	52_58	OP_listen_to headset 10 feet

VCSPA 200

Start Time	Context	Operator	Task ID	Task Description
0	default	ATC_Controller	101_63	ATC Tasks
0	descent	Captain	51_11	Autobrakes armed
0	descent	Captain	51_13	autobrakes level2
0	descent	Captain	51_2	Right MFD in Landing State (ND)
0	descent	Captain	51_28	speed is 200 knots Left PFD
0	descent	Captain	51_29	speed is 200 knots Right PFD
0	descent	Captain	51_3	Left MFD in Landing State (ND)
0	descent	Captain	51_31	Scenario Specific Settings
0	descent	Captain	51_33	Send scenario type to Sharp - Augmented
1	descent	Captain	111_36	Auditory monitor
1	descent	First_Officer	67_3	OP_auditory_monitor
6	default	ATC_Controller	101_24	NASA 227 Contact Regional Approach on 118.42.
6	default	ATC_Controller	101_54	Wait for NASA 227 altitude to be 10000 feet
6	descent	First_Officer	48_29	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6	descent	First_Officer	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6	descent	Captain	48_33	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6	descent	Captain	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
8.2	default	ATC_Controller	101_27	Wait for FO to say "NASA 227 switching. good day."
8.2	descent	First_Officer	48_31	?Comprehended?
8.2	descent	First_Officer	48_38	OP_say_message "NASA 227 switching good day"
9.6	descent	First_Officer	48_41	radio freq button
10	descent	First_Officer	48_42	OP_push_and_release
10.8	default	ATC_Controller	101_33	Wait for FO to radio "NASA 227 is with you at 10 thousand."
10.8	default	ATC_Controller	101_35	Say "Roger NASA 227 Descend and maintain 4000 ft"
10.8	descent	First_Officer	48_37	OP_say_message "NASA 227 is with you at 10 thousand"
10.8	descent	First_Officer	48_43	Wait for "Roger NASA 227 Descend and maintain 4000 ft"
10.8	descent	First_Officer	48_44	OP_listen_to "Roger NASA 227 Descend and maintain 4000 ft"
10.8	descent	Captain	48_47	Wait for "Roger NASA 227 Descend and maintain 4000 ft"
10.8	descent	Captain	48_48	OP_listen_to "Roger NASA 227 Descend and maintain 4000 ft"
12.7	descent	First_Officer	48_45	?Comprehended?
16.4	default	ATC_Controller	101_52	Wait for FO to radio "NASA 227 is leaving 10000 for 4 thousand."
16.4	descent	Captain	48_101	Wait for FO to say "NASA 227 is leaving 10000 for 4 thousand"
16.4	descent	Captain	48_102	OP_listen_to "NASA 227 is leaving 10000 for 4 thousand"
16.4	descent	First_Officer	48_119	?Comprehended?
16.4	descent	First_Officer	48_72	"NASA 227 is leaving 10 for 4."
19.4	descent	Captain	48_3	continue

21.1	descent	First_Officer	48_93	altitude knob
21.6	descent	First_Officer	48_94	USER_turn_dial
23.6	approach_initial	First_Officer	3_501	Bypass Descent Option
23.6	approach_initial	Captain	3_502	Bypass Descent Option
23.6	descent	First_Officer	48_4	continue
23.9	approach_initial	Captain	111_36	Auditory monitor
24.5	approach_initial	First_Officer	67_3	OP_auditory_monitor
25.4	default	ATC_Controller	101_31	Say "NASA 227 descend to 1800', maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.4	default	ATC_Controller	101_55	
25.6	approach_initial	First_Officer	3_125	Wait for ATC to say "NASA 227 descend to 1800', maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.6	approach_initial	Captain	3_126	Wait for ATC to say "NASA 227 descend to 1800', maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.6	approach_initial	Captain	3_127	Listen to Clearance
25.6	approach_initial	First_Officer	3_338	Wait for NASA 227 altitude to be 4000 feet
25.6	approach_initial	First_Officer	3_373	Listen to Clearance
25.6	approach_initial	Captain	3_522	Wait for NASA 227 altitude to be 4000 feet
29.4	default	ATC_Controller	101_53	Wait for Fo to radio "Roger, NASA 227 descend to 1800, maintain heading. Cleared to the RNAV Approach to Runwa (GPS) Zulu, Runway 18R."
29.4	approach_initial	First_Officer	3_10	"Roger, NASA 227 descend to 1800, maintain heading. Cleared to the RNAV Approach to Runway (GPS) Zulu, Runway 18R."
29.4	approach_initial	First_Officer	3_374	Wait to Comprehend
29.6	approach_initial	Captain	3_324	Wait for FO to say "Roger, NASA 227 descend to 1800, maintain heading.Cleared to the RNAV Approach to Runway (GPS) Zulu, Runway 18R."
29.6	approach_initial	Captain	3_325	Listen to Ack
33.7	approach_initial	Captain	3_350	Reach speed dial
34.2	approach_initial	Captain	3_354	set speed
36	approach_initial	Captain	3_351	Flaps One
36	approach_initial	Captain	3_503	Set CA PFD Speed to 180
36	approach_initial	Captain	3_504	Set FO PFD Speed to 180
36.5	approach_initial	Captain	3_505	Altitude < 2600
36.5	approach_initial	Captain	3_59	Call for Flaps 20
37.5	approach_initial	First_Officer	3_139	Wait to hear Flaps Command
37.5	approach_initial	First_Officer	3_469	OP_listen_to Flaps Command
37.5	approach_initial	First_Officer	3_524	Altitude < 2600
40.9	approach_initial	First_Officer	3_140	Wait to Comprehend Flaps
40.9	approach_initial	First_Officer	3_60	Reach for Flaps
41.3	approach_initial	First_Officer	3_61	Set Flaps
41.8	approach_initial	Captain	3_141	Wait for "ack Flaps"
41.8	approach_initial	First_Officer	3_303	Set Flaps Level on EICAS

41.8	approach_initial	Captain	3_468	OP_listen_to "ack Flaps"
41.8	approach_initial	First_Officer	3_62	Ack Flaps
45.8	approach_initial	Captain	3_142	Wait to Comprehend Flaps
45.8	approach_initial	First_Officer	3_145	Wait to hear gear down and final descent checklist
45.8	approach_initial	Captain	3_46	Call for "gear down and final decsent"
45.8	approach_initial	First_Officer	3_470	OP_listen_to gear down and final descent checklist
49.8	approach_initial	First_Officer	3_146	Wait to Comprehend Gear Down and final descent checklist
49.8	approach_initial	First_Officer	3_147	Reach for Landing Gear Control
50.2	approach_initial	First_Officer	3_148	Set Landing Gear
51	approach_initial	First_Officer	3_560	Final Descent Checklist
51.3	approach_initial	First_Officer	3_557	3 items
52.2	approach_initial	First_Officer	3_551	Check List
54.3	approach_initial	First_Officer	3_149	Ack Gear Down
54.3	approach_initial	First_Officer	3_154	Wait for Landing Gear Indicator
54.3	approach_initial	Captain	3_156	Wait for FO Ack of Gear Down
54.3	approach_initial	Captain	3_467	OP_listen_to Ack of Gear Down
54.3	approach_initial	First_Officer	3_526	Update EICAS
54.4	approach_initial	First_Officer	3_552	Verify
54.7	approach_initial	First_Officer	3_550	Ack Notification
55.8	approach_initial	First_Officer	3_553	Do for each check list item
58.2	approach_initial	Captain	3_157	Wait to Comprehend Headset
58.2	approach_initial	Captain	3_53	Reach speed dial
58.6	approach_initial	Captain	3_321	set speed
60.6	approach_initial	Captain	3_506	Set CA PFD Speed to 146
60.6	approach_initial	Captain	3_507	Set FO PFD Speed to 146
60.6	approach_initial	Captain	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
60.6	approach_initial	Captain	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
60.6	approach_initial	Captain	3_55	Call out Speed
61.5	approach_initial	Captain	3_248	speed brake
61.9	approach_initial	Captain	3_249	arm speed brake
62.4	approach_initial	Captain	3_511	Update EICAS
63.1	approach_initial	First_Officer	3_230	Wait for Flaps 25 request
63.1	approach_initial	Captain	3_253	Command Flaps 25
63.1	approach_initial	Captain	3_254	checklist done?
67.1	approach_initial	First_Officer	3_229	comprehend it
67.1	approach_initial	First_Officer	3_259	Flaps Control
67.4	approach_initial	First_Officer	3_257	Flaps Control
68	approach_initial	First_Officer	3_231	Ack Flaps 25
68	approach_initial	Captain	3_274	ConfirmFlaps 25

68	approach_initial	Captain	3_512	Wait for EICAS to display flaps 25
68	approach_initial	First_Officer	3_527	Set Flaps Level on Upper EICAS
68.4	approach_initial	Captain	3_261	Command Flaps 30
68.4	approach_initial	First_Officer	3_265	Wait for Flaps 30 request
72.3	approach_initial	First_Officer	3_264	comprehend it
72.3	approach_initial	First_Officer	3_269	Flaps Control
72.7	approach_initial	First_Officer	3_267	Flaps Control
73.3	approach_initial	First_Officer	3_266	Ack Flaps 30
73.3	approach_initial	First_Officer	3_273	radio freq control
73.3	approach_initial	Captain	3_276	ConfirmFlaps 30
73.3	approach_initial	Captain	3_513	Wait for EICAS to display flaps 30
73.3	approach_initial	First_Officer	3_528	Set Flaps Level on Upper EICAS
73.5	approach_initial	First_Officer	3_271	radio freq control
74.3	approach_initial	First_Officer	3_279	"Tower NASA 227 for 18 Right"
77.9	approach_initial	First_Officer	3_278	Set tower headset to "Tower NASA 227"
77.9	approach_initial	First_Officer	3_280	Listen to "Roger, NASA 227 for 18 Right."
77.9	approach_initial	First_Officer	3_360	Wait for Tower to say "Roger, NASA 227 for 18 Right."
77.9	approach_initial	Captain	3_379	Wait for Tower to say "Roger, NASA 227 for 18 Right."
77.9	approach_initial	Captain	3_465	OP_listen_to "Roger, NASA 227 for 18 Right."
77.9	default	ATC_Controller	39_37	Wait for comm from crew "Tower NASA 227 for 18 Right"
77.9	default	ATC_Controller	39_38	"Roger, NASA 227 for 18 Right"
92.4	approach_transitional_1	Captain	111_36	Auditory monitor
92.6	approach_transitional_1	First_Officer	67_3	OP_auditory_monitor
93.1	approach_transitional_1	First_Officer	3_564	Altitude < 1800
93.1	approach_transitional_1	First_Officer	3_567	Reach CDU
93.3	approach_transitional_1	First_Officer	3_565	Set Touchdown Elevation
122.7	approach_transitional_1	Captain	3_568	Alert on MCP (distraction of low salience)
122.7	approach_transitional_1	First_Officer	3_569	Alert on MCP (distraction of low salience)
122.7	approach_transitional_1	Captain	3_571	Altitude < 1400
122.7	approach_transitional_1	First_Officer	3_572	Altitude < 1400
152.6	approach_transitional_2	First_Officer	3_538	Altitude on PFD < 1000
158	approach_transitional_2	First_Officer	3_85	Call out 1000 feet - Instruments Cross Checked
158	approach_transitional_2	First_Officer	3_91	PFD
160.7	approach_transitional_2	Captain	3_519	Altitude < 900
160.7	approach_transitional_2	Captain	3_520	Alert on EICAS (distraction of low salience)
160.7	approach_transitional_2	First_Officer	3_533	Altitude < 900
160.7	approach_transitional_2	First_Officer	3_534	Alert on EICAS (distraction of low salience)
167.7	approach_transitional_2	Captain	3_514	Altitude < 800
167.7	approach_transitional_2	Captain	3_515	Altitude < 800

167.7	approach_transitional_2	First_Officer	3_529	Altitude < 800
167.7	approach_transitional_2	First_Officer	3_530	Altitude < 800
167.7	approach_final	Captain	97_157	800 ft Cloud
167.7	approach_final	First_Officer	97_163	800 ft Cloud
168	approach_final	First_Officer	67_3	OP_auditory_monitor
168.4	approach_final	Captain	111_36	Auditory monitor
179.6	approach_final	First_Officer	3_575	Altitude < 650
179.6	approach_final	Captain	3_576	Altitude < 650
179.6	land_initial	First_Officer	52_149	Manual or Autoland?
179.6	land_initial	Captain	52_61	Manual or Autoland?
180	land_initial	First_Officer	67_3	OP_auditory_monitor
180.4	land_initial	Captain	111_36	Auditory monitor
190.6	land_initial	Captain	52_236	Wait for automated comm 500 feet
190.6	land_initial	Captain	52_238	FO should call out "500 feet" not automation
190.6	land_initial	Captain	52_239	Altitude < 500
190.6	land_initial	First_Officer	52_247	Altitude < 500
190.6	land_initial	First_Officer	52_249	OP_listen_to headset 500 feet
191	land_initial	Captain	52_240	Final Flaps 30
191	land_initial	Captain	52_241	Set to internal comms to Final Flaps 30
191	land_initial	First_Officer	52_250	double check EICAS to ensure flaps 30
191	land_initial	First_Officer	52_251	confirm "final flaps 30"
193.1	land_initial	Captain	52_237	Comprehend?
213.7	land_initial	Captain	52_100	Altitude < 200
213.7	land_initial	First_Officer	52_101	Altitude < 200
213.7	land_initial	Captain	52_108	XYZ 633 Detected?
213.7	land_initial	First_Officer	52_112	XYZ 633 Detected?
213.7	land_final	Captain	52_135	Track Lead AC - CA
213.7	land_final	First_Officer	52_137	Track Lead AC - FO
213.7	land_final	First_Officer	52_222	Runway Detected?
213.7	land_initial	First_Officer	52_223	Altitude < 200
213.7	land_final	Captain	52_225	Call out "Runway in sight"
213.7	land_final	Captain	97_111	Acquire Lead AC - CA
213.7	land_final	First_Officer	97_114	Track Lead AC - FO
213.7	land_final	Captain	97_118	Acquire Runway - CA
213.7	land_final	First_Officer	97_122	Acquire Runway - FO
213.7	land_final	Captain	97_154	200 ft Cloud
213.7	land_final	First_Officer	97_166	200 ft Cloud
213.7	land_final	Captain	97_4	Set IMCstate to false
214	land_final	First_Officer	67_3	OP_auditory_monitor

214.4	land_final	Captain	111_36	Auditory monitor
214.4	land_final	Captain	52_206	Wait for internal comms to be runway in sight
214.4	land_final	First_Officer	52_207	OP_listen_to runway in sight
214.4	land_final	First_Officer	52_226	Set to headset to runway in sight
216.6	land_final	First_Officer	52_231	Final Descent Checklist complete
217.4	default	ATC_Controller	39_58	Calculate distance between ownship and intersection of 18R and E6.
217.6	default	ATC_Controller	39_47	Say "NASA 227 left turn on West Mike. Hold short of one-eight-left."
218.2	land_final	Captain	3_561	Wait for internal comm Final Descent Checklist complete
218.2	land_final	Captain	3_563	OP_listen_to Final Descent checklist complete
219.8	land_final	Captain	3_562	Confirm Roger Final Descent Checklist complete
220.6	land_final	Captain	52_120	Listen to FO's 100' callout
220.6	land_final	Captain	52_121	Altitude < 100
220.6	land_final	Captain	52_122	Listen to FO's 100' callout
220.6	land_final	Captain	52_233	Altitude < 100
220.6	land_final	First_Officer	52_234	Altitude < 100
220.6	land_final	First_Officer	52_6	Call out 100 feet
224.6	land_final	Captain	52_39	Altitude < 50 feet
224.6	land_final	Captain	52_40	Flare
228.4	land_final	Captain	52_18	Altitude < 1
228.4	land_final	Captain	52_19	RunToTDonly?
228.4	land_final	Captain	52_43	speed brake deploys

VCSPA 800

Start Time	Context	Operator	Task ID	Task Description
0.2	default	ATC_Controller	101_63	ATC Tasks
0.2	descent	Captain	51_11	Autobrakes armed
0.2	descent	Captain	51_13	autobrakes level2
0.2	descent	Captain	32_2	Default LH to yoke
0.2	descent	Captain	32_3	Default RH to Thrust Lever
0.2	default	ATC_Controller	101_64	End all ATC tasks sets from previous run
0.2	descent	Captain	51_2	Right MFD in Landing State (ND)
0.2	descent	Captain	51_8	Set Headset to voice
0.2	descent	Captain	51_28	speed is 200 knots Left PFD
0.2	descent	Captain	51_29	speed is 200 knots Right PFD
1.2	descent	Captain	111_36	Auditory monitor
1.2	descent	First_Officer	67_3	OP_auditory_monitor
6.2	default	ATC_Controller	101_24	NASA 227 Contact Regional Approach on 118.42.
6.2	descent	First_Officer	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6.2	descent	Captain	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
6.2	descent	First_Officer	48_29	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	descent	Captain	48_33	Wait for "NASA 227 contact Regional Approach on 118.42" comm from ATC
6.2	default	ATC_Controller	101_54	Wait for NASA 227 altitude to be 10000 feet
8.4	descent	First_Officer	48_38	OP_say_message "NASA 227 switching good day"
8.4	default	ATC_Controller	101_27	Wait for FO to say "NASA 227 switching. good day."
9.8	descent	First_Officer	48_41	radio freq button
10.2	descent	First_Officer	48_42	OP_push_and_release
11	descent	First_Officer	48_44	OP_listen_to "Roger, NASA 227 Descend and maintain 4000 ft"
11	descent	Captain	48_48	OP_listen_to "Roger, NASA 227 Descend and maintain 4000 ft"
11	descent	First_Officer	48_37	OP_say_message "NASA 227 is with you at 10 thousand"
11	default	ATC_Controller	101_35	Say "Roger NASA 227 Descend and maintain 4000 ft"
11	descent	First_Officer	48_43	Wait for "Roger, NASA 227 Descend and maintain 4000 ft"
11	descent	Captain	48_47	Wait for "Roger, NASA 227 Descend and maintain 4000 ft"
11	default	ATC_Controller	101_33	Wait for FO to radio "NASA 227 is with you at 10 thousand."
16.6	descent	Captain	48_102	OP_listen_to "NASA 227 is leaving 10 for 4"
16.6	descent	First_Officer	48_72	OP_say_message "NASA 227 is leaving 10 for 4"
16.6	default	ATC_Controller	101_52	Wait for FO to radio "NASA 227 is leaving 10 for 4"
16.6	descent	Captain	48_101	Wait for FO to say "NASA 227 is leaving 10 for 4"
18.6	descent	Captain	48_134	FLCH on MCP
21.3	descent	First_Officer	48_93	altitude knob

21.8	descent	First_Officer	48_94	USER_turn_dial
24.1	approach_initial	Captain	111_36	Auditory monitor
24.7	approach_initial	First_Officer	67_3	OP_auditory_monitor
25.6	default	ATC_Controller	101_31	Say "NASA 227 descend to 1800, maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.6	default	ATC_Controller	101_55	Wait for NASA 227 altitude to be 4000 feet
25.8	approach_initial	Captain	3_127	Listen to Clearance
25.8	approach_initial	First_Officer	3_373	Listen to Clearance
25.8	approach_initial	First_Officer	3_125	Wait for ATC to say "NASA 227 descend to 1800, maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.8	approach_initial	Captain	3_126	Wait for ATC to say "NASA 227 descend to 1800, maintain heading. Cleared to RNAV (GPS) Zulu, Runway 18R."
25.8	approach_initial	First_Officer	3_338	Wait for NASA 227 altitude to be 4000 feet
25.8	approach_initial	Captain	3_522	Wait for NASA 227 altitude to be 4000 feet
29.6	approach_initial	First_Officer	3_10	OP_say_message "Roger. NASA 227 descend to 1800, maintain heading. Cleared to the RNAV Approach to Runway (GPS) Zulu, Runway 18R."
29.6	default	ATC_Controller	101_53	Wait for FO to radio "Roger. NASA 227 descend to 1800, maintain heading. Cleared to the RNAV Approach to Runway (GPS) Zulu, Runway 18R."
29.8	approach_initial	Captain	3_325	
29.8	approach_initial	Captain	3_324	Wait for FO to say "Roger. NASA 227 descend to 1800, maintain heading. Cleared to the RNAV Approach to Runway (GPS) Zulu, Runway 18R."
33.9	approach_initial	Captain	3_350	Reach speed dial
34.4	approach_initial	Captain	3_354	set speed
36.2	approach_initial	Captain	3_351	Flaps One
36.2	approach_initial	Captain	3_503	Set CA PFD Speed to 180
36.2	approach_initial	Captain	3_504	Set FO PFD Speed to 180
36.7	approach_initial	Captain	3_505	Altitude < 2600
36.7	approach_initial	Captain	3_59	Call for Flaps 20
37.7	approach_initial	First_Officer	3_524	Altitude < 2600
37.7	approach_initial	First_Officer	3_469	OP_listen_to flaps command
37.7	approach_initial	First_Officer	3_139	Wait to hear Flaps Command
41.1	approach_initial	First_Officer	3_60	Reach for Flaps
41.1	approach_initial	First_Officer	3_140	Wait to Comprehend Flaps
41.5	approach_initial	First_Officer	3_61	Set Flaps
42	approach_initial	First_Officer	3_62	Ack Flaps
42	approach_initial	Captain	3_468	OP_listen_to ack Flaps
42	approach_initial	First_Officer	3_303	Set Flaps Level on EICAS
42	approach_initial	Captain	3_141	Wait for "ack Flaps"
46	approach_initial	Captain	3_46	Call for "gear down and final decsent"
46	approach_initial	First_Officer	3_470	OP_listen_to gear down and final descent
46	approach_initial	Captain	3_142	Wait to Comprehend Flaps
46	approach_initial	First_Officer	3_145	Wait to hear gear down and final descent checklist
50	approach_initial	First_Officer	3_147	Reach for Landing Gear Control

50	approach_initial	First_Officer	3_146	Wait to Comprehend Gear Down and final descent checklist
50.4	approach_initial	First_Officer	3_148	Set Landing Gear
51.2	approach_initial	First_Officer	3_560	Final Descent Checklist
51.5	approach_initial	First_Officer	3_557	3 items
52.4	approach_initial	First_Officer	3_551	Check List
54.5	approach_initial	First_Officer	3_149	Ack Gear Down
54.5	approach_initial	Captain	3_467	OP_listen_to Ack of Gear Down
54.5	approach_initial	First_Officer	3_526	Update EICAS
54.5	approach_initial	Captain	3_156	Wait for FO Ack of Gear Down
54.5	approach_initial	First_Officer	3_154	Wait for Landing Gear Indicator
54.6	approach_initial	First_Officer	3_552	Verify
54.9	approach_initial	First_Officer	3_550	Ack Notification
56	approach_initial	First_Officer	3_553	Do for each check list item
58.4	approach_initial	Captain	3_53	Reach speed dial
58.4	approach_initial	Captain	3_157	Wait to Comprehend Headset
58.8	approach_initial	Captain	3_321	set speed
60.8	approach_initial	Captain	3_55	Call out Speed
60.8	approach_initial	Captain	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
60.8	approach_initial	Captain	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
60.8	approach_initial	Captain	3_506	Set CA PFD Speed to 146
60.8	approach_initial	Captain	3_507	Set FO PFD Speed to 146
61.7	approach_initial	Captain	3_248	speed brake
62.1	approach_initial	Captain	3_249	arm speed brake
62.6	approach_initial	Captain	3_511	Update EICAS
63.3	approach_initial	Captain	3_254	checklist done?
63.3	approach_initial	Captain	3_253	Command Flaps 25
63.3	approach_initial	Captain	3_255	Set headset to flaps 25
63.3	approach_initial	First_Officer	3_230	Wait for Flaps 25 request
67.3	approach_initial	First_Officer	3_259	Flaps Control
67.6	approach_initial	First_Officer	3_257	Flaps Control
68.2	approach_initial	First_Officer	3_231	Ack Flaps 25
68.2	approach_initial	Captain	3_274	ConfirmFlaps 25
68.2	approach_initial	First_Officer	3_527	Set Flaps Level on Upper EICAS
68.2	approach_initial	Captain	3_512	Wait for EICAS to display flaps 25
68.6	approach_initial	Captain	3_261	Command Flaps 30
68.6	approach_initial	Captain	3_262	Set headset to flaps 30
68.6	approach_initial	First_Officer	3_265	Wait for Flaps 30 request
72.5	approach_initial	First_Officer	3_269	Flaps Control
72.9	approach_initial	First_Officer	3_267	Flaps Control

73.5	approach_initial	First_Officer	3_266	Ack Flaps 30
73.5	approach_initial	Captain	3_276	ConfirmFlaps 30
73.5	approach_initial	First_Officer	3_273	radio freq control
73.5	approach_initial	First_Officer	3_528	Set Flaps Level on Upper EICAS
73.5	approach_initial	Captain	3_513	Wait for EICAS to display flaps 30
73.7	approach_initial	First_Officer	3_271	radio freq control
74.5	approach_initial	First_Officer	3_279	"Tower NASA 227 for 18 Right"
78.1	approach_initial	First_Officer	3_280	Listen to "Roger, NASA 227 cleared for 18 Right"
78.1	approach_initial	Captain	3_465	OP_listen_to "Roger, NASA 227 cleared for 18 Right"
78.1	default	ATC_Controller	39_38	Say "Roger, NASA 227 cleared for 18 Right"
92.6	approach_transitional_1	Captain	111_36	Auditory monitor
92.8	approach_transitional_1	First_Officer	67_3	OP_auditory_monitor
93.3	approach_transitional_1	First_Officer	3_564	Altitude < 1800
93.3	approach_transitional_1	First_Officer	3_567	Reach CDU
93.5	approach_transitional_1	First_Officer	3_565	Set Touchdown Elevation
94.1	approach_transitional_1	First_Officer	3_566	Return rleft hand to Notepad
122.9	approach_transitional_1	Captain	3_568	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	First_Officer	3_569	Alert on MCP (distraction of low salience)
122.9	approach_transitional_1	Captain	3_571	Altitude < 1400
122.9	approach_transitional_1	First_Officer	3_572	Altitude < 1400
152.8	approach_transitional_2	First_Officer	3_538	Altitude on PFD < 1000
158.2	approach_transitional_2	First_Officer	3_85	Call out 1000 feet - Instruments Cross Checked
160.9	approach_transitional_2	Captain	3_520	Alert on EICAS (distraction of low salience)
160.9	approach_transitional_2	First_Officer	3_534	Alert on EICAS (distraction of low salience)
160.9	approach_transitional_2	Captain	3_519	Altitude < 900
160.9	approach_transitional_2	First_Officer	3_533	Altitude < 900
167.9	approach_final	Captain	97_157	800 ft Cloud
167.9	approach_final	First_Officer	97_163	800 ft Cloud
167.9	approach_final	Captain	3_449	XYZ 633 Detected?
167.9	approach_final	First_Officer	3_455	XYZ 633 Detected?
167.9	approach_final	Captain	97_105	Acquire Lead AC - CA
167.9	approach_final	First_Officer	97_108	Acquire Lead AC - FO
167.9	approach_final	Captain	97_116	Acquire Runway - CA
167.9	approach_transitional_2	Captain	3_514	Altitude < 800
167.9	approach_transitional_2	Captain	3_515	Altitude < 800
167.9	approach_transitional_2	First_Officer	3_529	Altitude < 800
167.9	approach_transitional_2	First_Officer	3_530	Altitude < 800
167.9	approach_final	First_Officer	97_147	Do not use if RNAV no pair
167.9	approach_final	Captain	97_151	Do not use if RNAV no pair

167.9	approach_final	First_Officer	3_494	Maintain Runway Alignment - FO
167.9	approach_final	Captain	97_3	Set IMCstate to false
167.9	approach_final	Captain	3_488	Track Lead AC - CA
167.9	approach_final	First_Officer	3_490	Track Lead AC - CA
168.2	approach_final	First_Officer	67_3	OP_auditory_monitor
168.6	approach_final	Captain	111_36	Auditory monitor
171.8	approach_final	First_Officer	3_531	Altitude < 750 (100' above DH)
171.8	approach_final	First_Officer	3_425	Approaching Decision Height comm from FO to Captain
179.8	approach_final	First_Officer	3_575	Altitude < 650
179.8	approach_final	Captain	3_576	Altitude < 650
179.8	land_initial	Captain	52_182	Altitude < 650
179.8	land_initial	First_Officer	52_212	Altitude < 650
179.8	land_initial	First_Officer	52_214	Call out "Runway in sight"
179.8	land_initial	First_Officer	52_211	Runway Detected?
179.8	land_initial	Captain	3_488	Track Lead AC - CA
179.8	land_initial	Captain	52_183	Turn off autopilot
180	land_initial	Captain	97_116	Acquire Runway - CA
180	land_initial	First_Officer	3_490	Track Lead AC - CA
180.1	land_initial	First_Officer	3_494	Maintain Runway Alignment - FO
180.2	land_initial	First_Officer	67_3	OP_auditory_monitor
180.5	land_initial	Captain	52_207	OP_listen_to runway in sight
180.5	land_initial	Captain	52_206	Wait for internal comms to be runway in sight
180.6	land_initial	Captain	111_36	Auditory monitor
180.6	land_initial	Captain	52_184	autopilot alarm sounds
180.9	land_initial	Captain	52_186	Silence Alarm
181.6	land_initial	Captain	52_187	Change autopilot button state
181.6	land_initial	Captain	52_15	throttle
181.6	land_initial	Captain	52_13	Trim and then Steer
182.5	land_initial	Captain	52_60	Spatial Comparison of Runway by OS
182.7	land_initial	First_Officer	52_220	Final Descent Checklist complete
182.8	land_initial	Captain	52_12	Apply Rudder
184.3	land_initial	Captain	3_563	OP_listen_to Final Descent Checklist complete
184.3	land_initial	Captain	3_561	Wait for internal comm Final Descent Checklist complete
185.9	land_initial	Captain	3_562	Confirm Roger Final Descent Checklist complete
190.6	land_initial	Captain	52_239	Altitude < 500
190.6	land_initial	First_Officer	52_242	Altitude < 500
190.6	land_initial	Captain	52_238	OP_listen_to automated comm 500 feet
190.6	land_initial	First_Officer	52_244	OP_listen_to headset 500 feet
190.6	land_initial	Captain	52_236	Wait for automated comm 500 feet

191	land_initial	First_Officer	52_246	ConfirmFlaps 30
191	land_initial	First_Officer	52_245	double check EICAS to ensure flaps 30
191	land_initial	Captain	52_240	Final Flaps 30
213.8	land_final	Captain	97_154	200 ft Cloud
213.8	land_final	First_Officer	97_166	200 ft Cloud
213.8	land_final	First_Officer	3_490	Track Lead AC - CA
213.9	land_final	Captain	97_116	Acquire Runway - CA
214	land_final	Captain	3_488	Track Lead AC - CA
214.1	land_final	First_Officer	3_494	Maintain Runway Alignment - FO
214.2	land_final	First_Officer	67_3	OP_auditory_monitor
214.5	land_final	Captain	111_36	Auditory monitor
214.7	land_final	Captain	52_12	Apply Rudder
214.7	land_final	Captain	52_15	throttle
214.7	land_final	Captain	52_13	Trim and then Steer
216.1	land_final	Captain	52_60	Spatial Comparison of Runway by OS
220.8	land_final	First_Officer	52_115	Altitude < 100
220.8	land_final	Captain	52_121	Altitude < 100
220.8	land_final	First_Officer	52_114	Call out 100 feet
220.8	land_final	Captain	52_122	Listen to FO's 100' callout
224.8	land_final	First_Officer	52_50	Altitude < 50
224.8	land_final	Captain	52_39	Altitude < 50 feet
224.8	land_final	Captain	52_40	Flare
224.8	land_final	First_Officer	52_52	OP_listen_to headset 50 feet
226.8	land_final	First_Officer	52_53	Altitude < 30
226.8	land_final	First_Officer	52_55	OP_listen_to headsdet 30 feet
227.8	land_final	First_Officer	52_56	Altitude < 10
227.8	land_final	First_Officer	52_58	OP_listen_to headset 10 feet
228.2	land_final	First_Officer	52_19	RunToTDonly?

ATC responsible Two-Stage Alert

RunNumber	Time	Context	Operator	start/end	Task ID	Task Name
1	2.7	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	2.7	descent	First_Officer	start	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	descent	Captain	start	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	default	ATC_Controller	start	101_79_130	Test Delay
1	4.9	default	ATC_Controller	end	101_24	NASA 227 Contact Regional Approach on 118.42.
1	4.9	descent	First_Officer	end	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	4.9	descent	Captain	end	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	5	descent	Captain	start	48_176	Liten to FO acknowledge ATC
1	5	descent	First_Officer	start	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	5	descent	First_Officer	start	48_41	radio freq button
1	5.3	descent	First_Officer	end	48_41	radio freq button
1	5.3	descent	First_Officer	start	48_40	return hand
1	5.3	descent	First_Officer	start	48_196	Set Radio Frequency
1	5.3	descent	First_Officer	end	48_196	Set Radio Frequency
1	5.5	descent	First_Officer	end	48_40	return hand
1	6.6	default	ATC_Controller	start	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	Captain	start	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	start	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	end	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	7.2	descent	Captain	end	48_176	Liten to FO acknowledge ATC
1	8.9	default	ATC_Controller	end	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	Captain	end	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	First_Officer	start	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	Captain	start	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	First_Officer	end	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	8.9	default	ATC_Controller	start	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	First_Officer	end	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	Captain	end	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	default	ATC_Controller	end	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.7	descent	Captain	start	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	11.7	descent	First_Officer	start	48_72	Say "Roger 4000 for NASA 227"
1	12.7	default	ATC_Controller	end	101_79_130	Test Delay
1	12.9	descent	First_Officer	start	48_93	altitude knob
1	12.9	descent	Captain	end	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	12.9	descent	First_Officer	end	48_72	Say "Roger 4000 for NASA 227"
1	13.3	descent	First_Officer	end	48_93	altitude knob
1	13.3	descent	First_Officer	start	48_94	USER_turn_dial

1	14.9	descent	First_Officer	start	48_92	return hand
1	14.9	descent	First_Officer	end	48_94	USER_turn_dial
1	15.2	descent	Captain	start	48_165	Confirm altitude.
1	15.2	descent	First_Officer	start	48_172	Listen to "Confirm altitude."
1	15.2	descent	First_Officer	end	48_92	return hand
1	16.1	descent	First_Officer	end	48_172	Listen to "Confirm altitude."
1	16.7	default	ATC_Controller	start	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	17.2	descent	Captain	end	48_165	Confirm altitude.
1	17.2	descent	Captain	start	48_134	FLCH on MCP
1	17.7	descent	Captain	end	48_134	FLCH on MCP
1	17.7	descent	Captain	start	48_135	return hand
1	18.2	descent	Captain	end	48_135	return hand
1	21.9	descent	First_Officer	start	48_187	Reach CDU
1	21.9	default	ATC_Controller	end	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	22.1	descent	First_Officer	end	48_187	Reach CDU
1	22.1	descent	First_Officer	start	48_185	Set Touchdown Elevation
1	22.8	descent	First_Officer	start	48_186	Return rleft hand to Notepad
1	22.8	descent	First_Officer	end	48_185	Set Touchdown Elevation
1	23	descent	Captain	start	48_190	Confirm TEZE Set
1	23	descent	First_Officer	end	48_186	Return rleft hand to Notepad
1	25	descent	Captain	end	48_190	Confirm TEZE Set
1	25	descent	First_Officer	start	48_193	Listen to "Crosscheck TEZE Set"
1	25	descent	Captain	start	48_192	Say "Crosscheck TEZE Set"
1	26	descent	First_Officer	end	48_193	Listen to "Crosscheck TEZE Set"
1	26	descent	Captain	end	48_192	Say "Crosscheck TEZE Set"
1	28	approach_initial	Captain	start	3_127	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	28	approach_initial	First_Officer	start	3_373	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	30.1	approach_initial	First_Officer	start	3_10	OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	30.2	approach_initial	Captain	start	3_325	Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	33.2	approach_initial	Captain	end	3_127	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	33.2	approach_initial	First_Officer	end	3_373	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	35.6	approach_initial	First_Officer	start	3_584	altitude knob
1	35.6	approach_initial	Captain	end	3_325	Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	35.6	approach_initial	First_Officer	end	3_10	OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R

						Approach contact Tower at NETEE 124.15 NASA 227"
1	36	approach_initial	First_Officer	end	3_584	altitude knob
1	36	approach_initial	First_Officer	start	3_585	Set altitude to 1800'
1	38	approach_initial	First_Officer	start	3_586	return hand
1	38	approach_initial	First_Officer	end	3_585	Set altitude to 1800'
1	38.2	approach_initial	Captain	start	3_589	Confirm Altitude 1800.
1	38.2	approach_initial	First_Officer	start	3_636	Listen to "Confirm Altitude 1800."
1	38.2	approach_initial	First_Officer	end	3_586	return hand
1	39.3	approach_initial	First_Officer	end	3_636	Listen to "Confirm Altitude 1800."
1	40.2	approach_initial	Captain	end	3_589	Confirm Altitude 1800.
1	40.2	approach_initial	Captain	start	3_350	Reach speed dial
1	40.7	approach_initial	Captain	end	3_350	Reach speed dial
1	40.7	approach_initial	Captain	start	3_809	Set Target Speed
1	45.7	approach_initial	Captain	start	3_375	return hand
1	45.7	approach_initial	Captain	end	3_809	Set Target Speed
1	46	approach_initial	First_Officer	start	3_603	Crosscheck Speed 180
1	46	approach_initial	Captain	start	3_646	Listen to "Crosscheck speed 180"
1	46	approach_initial	First_Officer	start	3_641	Listen to "Set speed 180."
1	46.2	approach_initial	Captain	end	3_375	return hand
1	46.6	approach_initial	First_Officer	end	3_641	Listen to "Set speed 180."
1	46.9	approach_initial	Captain	end	3_646	Listen to "Crosscheck speed 180"
1	47.9	approach_initial	First_Officer	end	3_603	Crosscheck Speed 180
1	51.2	approach_initial	Captain	start	3_351	Flaps One
1	51.2	approach_initial	First_Officer	start	3_598	OP_listen_to Flaps 1 Command
1	51.6	approach_initial	Captain	end	3_351	Flaps One
1	51.6	approach_initial	First_Officer	end	3_598	OP_listen_to Flaps 1 Command
1	56.3	approach_initial	First_Officer	start	3_590	Reach for Flaps
1	56.7	approach_initial	Captain	start	3_649	Listen to "Flaps 1"
1	56.7	approach_initial	First_Officer	end	3_590	Reach for Flaps
1	56.7	approach_initial	First_Officer	start	3_596	return hand
1	56.7	approach_initial	First_Officer	start	3_592	Say "Flaps 1"
1	56.7	approach_initial	First_Officer	start	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	end	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	start	3_597	Set Flaps Level on EICAS to "One"
1	56.7	approach_initial	First_Officer	end	3_597	Set Flaps Level on EICAS to "One"
1	56.9	approach_initial	First_Officer	end	3_596	return hand
1	57.1	approach_initial	Captain	start	3_601	Confirm Flaps "One"
1	57.1	approach_initial	First_Officer	start	3_676	Listen to "Confirm Flaps 1"
1	57.1	approach_initial	Captain	end	3_649	Listen to "Flaps 1"

1	57.2	approach_initial	First_Officer	end	3_592	Say "Flaps 1"
1	58	approach_initial	First_Officer	end	3_676	Listen to "Confirm Flaps 1"
1	59.1	approach_initial	Captain	end	3_601	Confirm Flaps "One"
1	59.1	approach_initial	Captain	start	3_691	Say "Flaps Five"
1	59.6	approach_initial	Captain	end	3_691	Say "Flaps Five"
1	64.2	approach_initial	First_Officer	start	3_700	OP_listen_to Flaps Five Command
1	64.2	approach_initial	First_Officer	start	3_692	Reach for Flaps
1	64.6	approach_initial	Captain	start	3_705	Listen to "Flaps Five"
1	64.6	approach_initial	First_Officer	end	3_692	Reach for Flaps
1	64.6	approach_initial	First_Officer	start	3_698	return hand
1	64.6	approach_initial	First_Officer	start	3_694	Say "Flaps Five"
1	64.6	approach_initial	First_Officer	start	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	end	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	start	3_699	Set Flaps Level on EICAS to "5"
1	64.6	approach_initial	First_Officer	end	3_699	Set Flaps Level on EICAS to "5"
1	64.7	approach_initial	First_Officer	end	3_700	OP_listen_to Flaps Five Command
1	64.8	approach_initial	First_Officer	end	3_698	return hand
1	65.1	approach_initial	First_Officer	end	3_694	Say "Flaps Five"
1	65.3	approach_initial	Captain	start	3_703	Confirm Flaps "Five"
1	65.3	approach_initial	First_Officer	start	3_707	Listen to "Confirm Flaps Five"
1	65.3	approach_initial	Captain	end	3_705	Listen to "Flaps Five"
1	65.3	approach_initial	Captain	start	3_710	Say "Flaps Fifteen"
1	66	approach_initial	First_Officer	end	3_707	Listen to "Confirm Flaps Five"
1	66	approach_initial	Captain	end	3_710	Say "Flaps Fifteen"
1	67.3	approach_initial	Captain	end	3_703	Confirm Flaps "Five"
1	70.6	approach_initial	First_Officer	start	3_719	OP_listen_to Flaps Fifteen Command
1	70.6	approach_initial	First_Officer	start	3_711	Reach for Flaps
1	70.9	approach_initial	Captain	start	3_724	Listen to "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	end	3_711	Reach for Flaps
1	70.9	approach_initial	First_Officer	start	3_717	return hand
1	70.9	approach_initial	First_Officer	start	3_713	Say "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	start	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	end	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	start	3_718	Set Flaps Level on EICAS to "15"
1	70.9	approach_initial	First_Officer	end	3_718	Set Flaps Level on EICAS to "15"
1	71.1	approach_initial	First_Officer	end	3_717	return hand
1	71.2	approach_initial	First_Officer	end	3_719	OP_listen_to Flaps Fifteen Command
1	71.6	approach_initial	First_Officer	end	3_713	Say "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_722	Confirm Flaps "Fifteen"

1	71.8	approach_initial	First_Officer	start	3_726	Listen to "Confirm Flaps Fifteen"
1	71.8	approach_initial	Captain	end	3_724	Listen to "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_754	Listen to Datalink Chime
1	72.9	approach_initial	First_Officer	end	3_726	Listen to "Confirm Flaps Fifteen"
1	72.9	approach_initial	Captain	end	3_754	Listen to Datalink Chime
1	73.8	approach_initial	Captain	end	3_722	Confirm Flaps "Fifteen"
1	77.1	approach_initial	First_Officer	start	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	end	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	start	3_759	Reach for Lower EICAS
1	78.7	approach_initial	First_Officer	start	3_760	Push button on Lower EICAS to open message
1	78.7	approach_initial	First_Officer	end	3_759	Reach for Lower EICAS
1	79.4	approach_initial	First_Officer	end	3_760	Push button on Lower EICAS to open message
1	79.4	approach_initial	First_Officer	start	3_761	Return hand to Notepad
1	79.6	approach_initial	Captain	start	3_771	Listen to "Datalink message to read"
1	79.6	approach_initial	First_Officer	start	3_763	Reading Datalink Message
1	79.6	approach_initial	First_Officer	end	3_761	Return hand to Notepad
1	79.6	approach_initial	First_Officer	start	3_764	Verbalizing Datalink Message aloud to Captain
1	80.8	approach_initial	Captain	end	3_771	Listen to "Datalink message to read"
1	80.8	approach_initial	First_Officer	end	3_764	Verbalizing Datalink Message aloud to Captain
1	81.1	approach_initial	First_Officer	end	3_763	Reading Datalink Message
1	84.9	approach_initial	Captain	start	3_767	Captain tells FO to "Accept Datalink Message"
1	84.9	approach_initial	First_Officer	start	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	end	3_767	Captain tells FO to "Accept Datalink Message"
1	86	approach_initial	First_Officer	end	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	start	3_781	Reach for Lower EICAS
1	86.4	approach_initial	Captain	start	3_782	Push button on Lower MCP to engate separation automation
1	86.4	approach_initial	Captain	end	3_781	Reach for Lower EICAS
1	87.1	approach_initial	Captain	end	3_782	Push button on Lower MCP to engate separation automation
1	87.1	approach_initial	Captain	start	3_783	Return hand to Notepad
1	87.3	approach_initial	Captain	end	3_783	Return hand to Notepad
1	90.2	approach_initial	First_Officer	start	3_776	Reach for Lower EICAS
1	90.5	approach_initial	First_Officer	start	3_777	Push button on Lower EICAS to accept message
1	90.5	approach_initial	First_Officer	end	3_776	Reach for Lower EICAS
1	91.2	approach_initial	First_Officer	end	3_777	Push button on Lower EICAS to accept message
1	91.2	approach_initial	First_Officer	start	3_778	Return hand to Notepad
1	91.4	approach_initial	First_Officer	end	3_778	Return hand to Notepad
1	94.7	approach_initial	Captain	start	3_59	Call for Flaps 20
1	95.1	approach_initial	Captain	end	3_59	Call for Flaps 20
1	99	approach_initial	First_Officer	start	3_469	OP_listen_to flaps command

1	99.4	approach_initial	First_Officer	end	3_469	OP_listen_to flaps command
1	99.9	approach_initial	First_Officer	start	3_60	Reach for Flaps
1	100.3	approach_initial	Captain	start	3_468	OP_listen_to "Flaps 20"
1	100.3	approach_initial	First_Officer	end	3_60	Reach for Flaps
1	100.3	approach_initial	First_Officer	start	3_205	return hand
1	100.3	approach_initial	First_Officer	start	3_62	Say "Flaps 20"
1	100.3	approach_initial	First_Officer	start	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	end	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	start	3_303	Set Flaps Level on EICAS
1	100.3	approach_initial	First_Officer	end	3_303	Set Flaps Level on EICAS
1	100.5	approach_initial	First_Officer	end	3_205	return hand
1	100.7	approach_initial	First_Officer	end	3_62	Say "Flaps 20"
1	100.9	approach_initial	Captain	end	3_468	OP_listen_to "Flaps 20"
1	105.4	approach_initial	Captain	start	3_680	Confirm Flaps 20
1	105.4	approach_initial	First_Officer	start	3_683	Listen to "Confirm Flaps 20"
1	106.2	approach_initial	First_Officer	end	3_683	Listen to "Confirm Flaps 20"
1	107.4	approach_initial	Captain	start	3_46	Command "Gear Down Landing Checklist
1	107.4	approach_initial	Captain	end	3_680	Confirm Flaps 20
1	107.4	approach_initial	Captain	start	3_242	RH throttle
1	107.7	approach_initial	Captain	end	3_242	RH throttle
1	108.8	approach_initial	Captain	end	3_46	Command "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_470	OP_listen_to "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	end	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	start	3_207	return hand
1	113.2	approach_initial	First_Officer	start	3_808	Set Gear
1	113.2	approach_initial	First_Officer	end	3_808	Set Gear
1	113.5	approach_initial	First_Officer	start	3_548	Display Select Panel
1	113.5	approach_initial	First_Officer	start	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_207	return hand
1	113.8	approach_initial	First_Officer	end	3_548	Display Select Panel
1	113.8	approach_initial	First_Officer	start	3_549	Display Select Panel
1	114.2	approach_initial	First_Officer	end	3_470	OP_listen_to "Gear Down Landing Checklist
1	114.5	approach_initial	First_Officer	end	3_549	Display Select Panel
1	114.5	approach_initial	First_Officer	start	3_555	Return LH to default spot
1	114.8	approach_initial	First_Officer	start	3_551	Check List
1	114.8	approach_initial	First_Officer	end	3_555	Return LH to default spot
1	117.1	approach_initial	First_Officer	end	3_551	Check List

1	117.1	approach_initial	First_Officer	start	3_552	Verify
1	117.4	approach_initial	First_Officer	start	3_550	Ack Notification
1	117.4	approach_initial	First_Officer	end	3_552	Verify
1	118.4	approach_initial	First_Officer	start	3_149	Ack Gear Down
1	118.4	approach_initial	First_Officer	end	3_550	Ack Notification
1	118.4	approach_initial	First_Officer	start	3_551	Check List
1	118.4	approach_initial	Captain	start	3_467	OP_listen_to Ack of Gear Down
1	118.4	approach_initial	First_Officer	start	3_152	Set Landing Gear Indicator
1	118.4	approach_initial	First_Officer	end	3_152	Set Landing Gear Indicator
1	118.4	approach_initial	First_Officer	start	3_526	Update EICAS
1	118.4	approach_initial	First_Officer	end	3_526	Update EICAS
1	119	approach_initial	First_Officer	end	3_149	Ack Gear Down
1	119	approach_initial	Captain	end	3_467	OP_listen_to Ack of Gear Down
1	120.7	approach_initial	First_Officer	end	3_551	Check List
1	120.7	approach_initial	First_Officer	start	3_552	Verify
1	121.2	approach_initial	First_Officer	start	3_550	Ack Notification
1	121.2	approach_initial	First_Officer	end	3_552	Verify
1	122.2	approach_initial	First_Officer	end	3_550	Ack Notification
1	122.2	approach_initial	First_Officer	start	3_551	Check List
1	123.7	approach_initial	Captain	start	3_608	Confirm gear down
1	124.5	approach_initial	First_Officer	end	3_551	Check List
1	124.5	approach_initial	First_Officer	start	3_552	Verify
1	124.7	approach_initial	First_Officer	start	3_550	Ack Notification
1	124.7	approach_initial	First_Officer	end	3_552	Verify
1	125.7	approach_initial	First_Officer	end	3_550	Ack Notification
1	125.7	approach_initial	Captain	end	3_608	Confirm gear down
1	125.7	approach_initial	Captain	start	3_53	Reach speed dial
1	126.1	approach_initial	Captain	end	3_53	Reach speed dial
1	126.1	approach_initial	Captain	start	3_810	Set Target Speed
1	131.1	approach_initial	Captain	start	3_55	Call out Speed
1	131.1	approach_initial	Captain	start	3_381	get altitude to report
1	131.1	approach_initial	Captain	end	3_381	get altitude to report
1	131.1	approach_initial	Captain	start	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	First_Officer	start	3_627	Listen to "Speed is 146 knots"
1	131.1	approach_initial	Captain	start	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_810	Set Target Speed
1	132	approach_initial	Captain	end	3_55	Call out Speed

1	132	approach_initial	First_Officer	end	3_627	Listen to "Speed is 146 knots"
1	136.4	approach_initial	First_Officer	start	3_610	Confirm Speed 146
1	136.4	approach_initial	Captain	start	3_655	Crosscheck speed 146
1	137.4	approach_initial	Captain	end	3_655	Crosscheck speed 146
1	138.4	approach_initial	First_Officer	end	3_610	Confirm Speed 146
1	141.7	approach_initial	Captain	start	3_248	speed brake
1	142	approach_initial	Captain	start	3_249	arm speed brake
1	142	approach_initial	Captain	end	3_248	speed brake
1	142.7	approach_initial	Captain	end	3_249	arm speed brake
1	142.7	approach_initial	Captain	start	3_210	Return Hand
1	142.7	approach_initial	Captain	start	3_511	Update EICAS
1	142.7	approach_initial	Captain	end	3_511	Update EICAS
1	143	approach_initial	First_Officer	start	3_748	Listen to "Checking LNAV and VNAV Mode"
1	143	approach_initial	Captain	start	3_744	LNAV and VNAV Check
1	143	approach_initial	Captain	end	3_210	Return Hand
1	143	approach_initial	Captain	start	3_745	Say "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	First_Officer	end	3_748	Listen to "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	Captain	end	3_745	Say "Checking LNAV and VNAV Mode"
1	144.5	approach_initial	Captain	end	3_744	LNAV and VNAV Check
1	148.4	approach_transitional_1	First_Officer	start	3_750	Confirm LNAV and VNAV Modes
1	148.4	approach_transitional_1	Captain	start	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	149.8	approach_transitional_1	Captain	start	3_253	Command Flaps 25
1	149.8	approach_transitional_1	Captain	end	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	150.2	approach_transitional_1	Captain	end	3_253	Command Flaps 25
1	150.4	approach_transitional_1	First_Officer	end	3_750	Confirm LNAV and VNAV Modes
1	150.4	approach_transitional_1	First_Officer	start	3_656	Listen to Flaps 25
1	150.8	approach_transitional_1	First_Officer	end	3_656	Listen to Flaps 25
1	155.2	approach_transitional_1	First_Officer	start	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	end	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	start	3_231	FO acknowledges "Flaps 25"
1	155.5	approach_transitional_1	Captain	start	3_653	Listen to "Flaps 25"
1	155.5	approach_transitional_1	First_Officer	start	3_258	Return LH to default spot
1	155.5	approach_transitional_1	First_Officer	start	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	end	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	start	3_527	Set Flaps Level on Upper EICAS
1	155.5	approach_transitional_1	First_Officer	end	3_527	Set Flaps Level on Upper EICAS
1	155.7	approach_transitional_1	First_Officer	end	3_258	Return LH to default spot
1	155.9	approach_transitional_1	First_Officer	end	3_231	FO acknowledges "Flaps 25"
1	156.1	approach_transitional_1	Captain	end	3_653	Listen to "Flaps 25"

1	160.6	approach_transitional_1	Captain	start	3_658	Crosscheck Flaps 25
1	160.6	approach_transitional_1	Captain	start	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	Captain	end	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	First_Officer	start	3_667	Listen to Crosscheck
1	161.6	approach_transitional_1	First_Officer	end	3_667	Listen to Crosscheck
1	162.6	approach_transitional_1	Captain	end	3_658	Crosscheck Flaps 25
1	167.7	approach_transitional_1	First_Officer	start	3_660	Flaps 30
1	167.7	approach_transitional_1	First_Officer	start	3_269	Flaps Control
1	168.1	approach_transitional_1	First_Officer	end	3_660	Flaps 30
1	168.1	approach_transitional_1	First_Officer	end	3_269	Flaps Control
1	168.1	approach_transitional_1	Captain	start	3_665	Listen to "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_268	Return LH to default spot
1	168.1	approach_transitional_1	First_Officer	start	3_266	Say "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	end	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	start	3_528	Set Flaps Level on Upper EICAS
1	168.1	approach_transitional_1	First_Officer	end	3_528	Set Flaps Level on Upper EICAS
1	168.3	approach_transitional_1	First_Officer	end	3_268	Return LH to default spot
1	168.5	approach_transitional_1	First_Officer	end	3_266	Say "Flaps 30"
1	168.7	approach_transitional_1	Captain	end	3_665	Listen to "Flaps 30"
1	173.2	approach_transitional_1	Captain	start	3_666	Crosscheck Flaps 30
1	173.2	approach_transitional_1	Captain	start	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	Captain	end	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	First_Officer	start	3_672	Listen to Crosscheck
1	174.1	approach_transitional_1	First_Officer	end	3_672	Listen to Crosscheck
1	175.2	approach_transitional_1	Captain	start	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_666	Crosscheck Flaps 30
1	178.3	approach_transitional_1	First_Officer	start	3_686	Landing Checklist complete
1	178.3	approach_transitional_1	Captain	start	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	Captain	start	3_562	Confirm Roger Landing Checklist complete
1	179.6	approach_transitional_1	First_Officer	end	3_686	Landing Checklist complete
1	179.6	approach_transitional_1	Captain	end	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	First_Officer	start	3_273	radio freq control
1	180	approach_transitional_1	First_Officer	start	3_271	radio freq control
1	180	approach_transitional_1	First_Officer	end	3_273	radio freq control
1	180.7	approach_transitional_1	First_Officer	end	3_271	radio freq control
1	180.7	approach_transitional_1	First_Officer	start	3_272	Return hand
1	180.9	approach_transitional_1	First_Officer	start	3_279	OP_say_message "Tower NASA 227 for one-eight-right"

1	180.9	approach_transitional_1	First_Officer	end	3_272	Return hand
1	181.2	approach_transitional_1	Captain	end	3_562	Confirm Roger Landing Checklist complete
1	182.7	approach_transitional_1	First_Officer	start	3_280	Listen to
1	182.7	approach_transitional_1	Captain	start	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	182.7	approach_transitional_1	First_Officer	end	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	182.7	default	ATC_Controller	start	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	184	approach_transitional_1	Captain	end	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	184.8	default	ATC_Controller	start	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	184.8	approach_transitional_1	First_Officer	start	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	184.8	approach_transitional_1	First_Officer	end	3_280	Listen to
1	184.8	default	ATC_Controller	end	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	185.1	default	ATC_Controller	end	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	187.4	approach_transitional_1	First_Officer	end	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	204.8	approach_transitional_2	First_Officer	start	3_85	Call out 1000 feet - Instruments Cross Checked
1	204.8	approach_transitional_2	First_Officer	start	3_91	PFD
1	204.8	approach_transitional_2	First_Officer	end	3_91	PFD
1	206.7	approach_transitional_2	First_Officer	end	3_85	Call out 1000 feet - Instruments Cross Checked
1	220.7	default	ATC_Controller		101_79_70	Check ATC display for Yellow Blunder
1	227.6	default	ATC_Controller		101_79_98	Say "XYZ 633 Yellow Blunder Alert."
1	227.6	default	ATC_Controller		101_79_120	Yellow in Progress
1	229	default	ATC_Controller		101_79_102	ATC Determines MAP
1	232	default	ATC_Controller		101_79_103	Declare Time of ATC_MAP_Plan Finished Reset variables
1	232	default	ATC_Controller		101_79_131	Wake Display Detected?
1	232.4	default	ATC_Controller		101_79_98	Say "XYZ 633 Yellow Blunder Alert."
1	232.4	default	ATC_Controller		101_79_120	Yellow in Progress
1	233.9	default	ATC_Controller		101_79_102	ATC Determines MAP
1	234.3	land_initial	First_Officer		116_12	Comprehension of Upper EICAS?
1	236.9	default	ATC_Controller		101_79_103	Declare Time of ATC_MAP_Plan Finished Reset variables
1	236.9	default	ATC_Controller		101_79_131	Wake Display Detected?
1	237.1	land_initial	Captain		115_12	Comprehension of Upper EICAS?
1	240.8	default	ATC_Controller		101_79_109	ATC communicate MA plan to trailing aircraft (routing task)
1	240.8	default	ATC_Controller		101_79_69	ATC Communicates MA to Pilot
1	240.8	default	ATC_Controller		101_79_114	ATC Detects Wake on Blunder Display
1	240.8	default	ATC_Controller		101_79_127	ATC MAP Plan Recent Enough
1	240.8	default	ATC_Controller		101_79_71	ATC to Pilot: "NASA 227 Execute Standard missed approach procedure climb to MAO."
1	240.8	default	ATC_Controller		101_79_86	ATC Wake (wind) Comprehended?
1	240.8	default	ATC_Controller		101_79_105	Check ATC display for Red Blunder
1	240.8	land_initial	Captain		100_285	Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions
1	240.8	land_initial	First_Officer		100_528	Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions

1	240.8	land_initial	Captain	100_289	Listen to "NASA 227 Execute Standard missed approach procedure climb to MAO.'
1	240.8	land_initial	First_Officer	100_530	Listen to "NASA 227 Execute Standard missed approach procedure climb to MAO.'
1	240.8	default	ATC_Controller	101_79_104	MAP Plan within the past 10 seconds?
1	240.8	default	ATC_Controller	101_79_123	Red Blunder in Progress
1	241.6	land_initial	Captain	100_519	AC Red Blunder Comprehended
1	241.6	land_initial	Captain	100_516	Aircraft in Red Blunder State Detected?
1	241.6	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	241.6	land_initial	Captain	100_518	Red Blunder Visible
1	241.9	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	242.3	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	242.7	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	243	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	243.2	land_initial	Captain	100_512	CA: "Prepare for standard missed approach procedure..."
1	243.2	land_initial	First_Officer	100_537	CA: "Prepare for standard missed approach procedure..."
1	243.2	land_initial	Captain	100_51	Ensure Single Press of TOGA Button
1	243.2	land_initial	First_Officer	100_685	Hear CA verbalizing MAP; stop all previous tasks and listen
1	243.2	land_initial	First_Officer	100_536	Listen to "Prepare for standard missed approach procedure climb to MAP."
1	243.2	land_initial	Captain	100_45	Press TOGA button if alert is visible
1	243.2	land_initial	Captain	100_33	Press TOGA Button on Thrust Lever
1	243.2	land_initial	Captain	100_511	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	244	breakaway	Captain	100_34	TOGA Button is in Pressed state

ATC Responsible One-Stage Alert

RunNumber	Time	Context	Operator	start/end	Task ID	Task Name
1	2.7	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	2.7	descent	First_Officer	start	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	descent	Captain	start	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	default	ATC_Controller	start	101_79_130	Test Delay
1	4.9	default	ATC_Controller	end	101_24	NASA 227 Contact Regional Approach on 118.42.
1	4.9	descent	First_Officer	end	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	4.9	descent	Captain	end	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	5	descent	Captain	start	48_176	Liten to FO acknowledge ATC
1	5	descent	First_Officer	start	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	5	descent	First_Officer	start	48_41	radio freq button
1	5.3	descent	First_Officer	end	48_41	radio freq button
1	5.3	descent	First_Officer	start	48_40	return hand
1	5.3	descent	First_Officer	start	48_196	Set Radio Frequency
1	5.3	descent	First_Officer	end	48_196	Set Radio Frequency
1	5.5	descent	First_Officer	end	48_40	return hand
1	6.6	default	ATC_Controller	start	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	Captain	start	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	start	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	end	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	7.2	descent	Captain	end	48_176	Liten to FO acknowledge ATC
1	8.9	default	ATC_Controller	end	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	Captain	end	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	First_Officer	start	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	Captain	start	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	First_Officer	end	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	8.9	default	ATC_Controller	start	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	10.1	descent	Captain	start	100_272	Captain's path
1	11.6	descent	First_Officer	end	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	Captain	end	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	default	ATC_Controller	end	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.7	descent	Captain	start	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	11.7	descent	First_Officer	start	48_72	Say "Roger 4000 for NASA 227"
1	12.7	default	ATC_Controller	end	101_79_130	Test Delay

1	12.9	descent	First_Officer	start	48_93	altitude knob
1	12.9	descent	Captain	end	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	12.9	descent	First_Officer	end	48_72	Say "Roger 4000 for NASA 227"
1	13.3	descent	First_Officer	end	48_93	altitude knob
1	13.3	descent	First_Officer	start	48_94	USER_turn_dial
1	14.9	descent	First_Officer	start	48_92	return hand
1	14.9	descent	First_Officer	end	48_94	USER_turn_dial
1	15.2	descent	Captain	start	48_165	Confirm altitude.
1	15.2	descent	First_Officer	start	48_172	Listen to "Confirm altitude."
1	15.2	descent	First_Officer	end	48_92	return hand
1	16.1	descent	First_Officer	end	48_172	Listen to "Confirm altitude."
1	16.7	default	ATC_Controller	start	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	17.2	descent	Captain	end	48_165	Confirm altitude.
1	17.2	descent	Captain	start	48_134	FLCH on MCP
1	17.7	descent	Captain	end	48_134	FLCH on MCP
1	17.7	descent	Captain	start	48_135	return hand
1	18.2	descent	Captain	end	48_135	return hand
1	21.9	descent	First_Officer	start	48_187	Reach CDU
1	21.9	default	ATC_Controller	end	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	22.1	descent	First_Officer	end	48_187	Reach CDU
1	22.1	descent	First_Officer	start	48_185	Set Touchdown Elevation
1	22.8	descent	First_Officer	start	48_186	Return rleft hand to Notepad
1	22.8	descent	First_Officer	end	48_185	Set Touchdown Elevation
1	23	descent	Captain	start	48_190	Confirm TEZE Set
1	23	descent	First_Officer	end	48_186	Return rleft hand to Notepad
1	25	descent	Captain	end	48_190	Confirm TEZE Set
1	25	descent	First_Officer	start	48_193	Listen to "Crosscheck TEZE Set"
1	25	descent	Captain	start	48_192	Say "Crosscheck TEZE Set"
1	26	descent	First_Officer	end	48_193	Listen to "Crosscheck TEZE Set"
1	26	descent	Captain	end	48_192	Say "Crosscheck TEZE Set" OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	28	approach_initial	Captain	start	3_127	Approach contact Tower at NETEE on 124.15" OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	28	approach_initial	First_Officer	start	3_373	Approach contact Tower at NETEE on 124.15" OP_say_message "Roger descend and maintain 1800'. Cleared
1	30.1	approach_initial	First_Officer	start	3_10	for the RNAV 18R

						Approach contact Tower at NETEE 124.15 NASA 227"
						Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	30.2	approach_initial	Captain	start	3_325	Approach contact Tower at NETEE 124.15 NASA 227"
						OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	33.2	approach_initial	Captain	end	3_127	Approach contact Tower at NETEE on 124.15"
						OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	33.2	approach_initial	First_Officer	end	3_373	Approach contact Tower at NETEE on 124.15"
1	35.6	approach_initial	First_Officer	start	3_584	altitude knob
						Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	35.6	approach_initial	Captain	end	3_325	Approach contact Tower at NETEE 124.15 NASA 227"
						OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	35.6	approach_initial	First_Officer	end	3_10	Approach contact Tower at NETEE 124.15 NASA 227"
1	36	approach_initial	First_Officer	end	3_584	altitude knob
1	36	approach_initial	First_Officer	start	3_585	Set altitude to 1800'
1	38	approach_initial	First_Officer	start	3_586	return hand
1	38	approach_initial	First_Officer	end	3_585	Set altitude to 1800'
1	38.2	approach_initial	Captain	start	3_589	Confirm Altitude 1800.
1	38.2	approach_initial	First_Officer	start	3_636	Listen to "Confirm Altitude 1800."
1	38.2	approach_initial	First_Officer	end	3_586	return hand
1	39.3	approach_initial	First_Officer	end	3_636	Listen to "Confirm Altitude 1800."
1	40.2	approach_initial	Captain	end	3_589	Confirm Altitude 1800.
1	40.2	approach_initial	Captain	start	3_350	Reach speed dial
1	40.7	approach_initial	Captain	end	3_350	Reach speed dial
1	40.7	approach_initial	Captain	start	3_809	Set Target Speed
1	45.7	approach_initial	Captain	start	3_375	return hand
1	45.7	approach_initial	Captain	end	3_809	Set Target Speed
1	46	approach_initial	First_Officer	start	3_603	Crosscheck Speed 180
1	46	approach_initial	Captain	start	3_646	Listen to "Crosscheck speed 180"
1	46	approach_initial	First_Officer	start	3_641	Listen to "Set speed 180."
1	46.2	approach_initial	Captain	end	3_375	return hand
1	46.6	approach_initial	First_Officer	end	3_641	Listen to "Set speed 180."
1	46.9	approach_initial	Captain	end	3_646	Listen to "Crosscheck speed 180"
1	47.9	approach_initial	First_Officer	end	3_603	Crosscheck Speed 180
1	51.2	approach_initial	Captain	start	3_351	Flaps One
1	51.2	approach_initial	First_Officer	start	3_598	OP_listen_to Flaps 1 Command
1	51.6	approach_initial	Captain	end	3_351	Flaps One
1	51.6	approach_initial	First_Officer	end	3_598	OP_listen_to Flaps 1 Command

1	56.3	approach_initial	First_Officer	start	3_590	Reach for Flaps
1	56.7	approach_initial	Captain	start	3_649	Listen to "Flaps 1"
1	56.7	approach_initial	First_Officer	end	3_590	Reach for Flaps
1	56.7	approach_initial	First_Officer	start	3_596	return hand
1	56.7	approach_initial	First_Officer	start	3_592	Say "Flaps 1"
1	56.7	approach_initial	First_Officer	start	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	end	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	start	3_597	Set Flaps Level on EICAS to "One"
1	56.7	approach_initial	First_Officer	end	3_597	Set Flaps Level on EICAS to "One"
1	56.9	approach_initial	First_Officer	end	3_596	return hand
1	57.1	approach_initial	Captain	start	3_601	Confirm Flaps "One"
1	57.1	approach_initial	First_Officer	start	3_676	Listen to "Confirm Flaps 1"
1	57.1	approach_initial	Captain	end	3_649	Listen to "Flaps 1"
1	57.2	approach_initial	First_Officer	end	3_592	Say "Flaps 1"
1	58	approach_initial	First_Officer	end	3_676	Listen to "Confirm Flaps 1"
1	59.1	approach_initial	Captain	end	3_601	Confirm Flaps "One"
1	59.1	approach_initial	Captain	start	3_691	Say "Flaps Five"
1	59.6	approach_initial	Captain	end	3_691	Say "Flaps Five"
1	64.2	approach_initial	First_Officer	start	3_700	OP_listen_to Flaps Five Command
1	64.2	approach_initial	First_Officer	start	3_692	Reach for Flaps
1	64.6	approach_initial	Captain	start	3_705	Listen to "Flaps Five"
1	64.6	approach_initial	First_Officer	end	3_692	Reach for Flaps
1	64.6	approach_initial	First_Officer	start	3_698	return hand
1	64.6	approach_initial	First_Officer	start	3_694	Say "Flaps Five"
1	64.6	approach_initial	First_Officer	start	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	end	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	start	3_699	Set Flaps Level on EICAS to "5"
1	64.6	approach_initial	First_Officer	end	3_699	Set Flaps Level on EICAS to "5"
1	64.7	approach_initial	First_Officer	end	3_700	OP_listen_to Flaps Five Command
1	64.8	approach_initial	First_Officer	end	3_698	return hand
1	65.1	approach_initial	First_Officer	end	3_694	Say "Flaps Five"
1	65.3	approach_initial	Captain	start	3_703	Confirm Flaps "Five"
1	65.3	approach_initial	First_Officer	start	3_707	Listen to "Confirm Flaps Five"
1	65.3	approach_initial	Captain	end	3_705	Listen to "Flaps Five"
1	65.3	approach_initial	Captain	start	3_710	Say "Flaps Fifteen"
1	66	approach_initial	First_Officer	end	3_707	Listen to "Confirm Flaps Five"
1	66	approach_initial	Captain	end	3_710	Say "Flaps Fifteen"
1	67.3	approach_initial	Captain	end	3_703	Confirm Flaps "Five"
1	70.6	approach_initial	First_Officer	start	3_719	OP_listen_to Flaps Fifteen Command

1	70.6	approach_initial	First_Officer	start	3_711	Reach for Flaps
1	70.9	approach_initial	Captain	start	3_724	Listen to "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	end	3_711	Reach for Flaps
1	70.9	approach_initial	First_Officer	start	3_717	return hand
1	70.9	approach_initial	First_Officer	start	3_713	Say "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	start	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	end	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	start	3_718	Set Flaps Level on EICAS to "15"
1	70.9	approach_initial	First_Officer	end	3_718	Set Flaps Level on EICAS to "15"
1	71.1	approach_initial	First_Officer	end	3_717	return hand
1	71.2	approach_initial	First_Officer	end	3_719	OP_listen_to Flaps Fifteen Command
1	71.6	approach_initial	First_Officer	end	3_713	Say "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_722	Confirm Flaps "Fifteen"
1	71.8	approach_initial	First_Officer	start	3_726	Listen to "Confirm Flaps Fifteen"
1	71.8	approach_initial	Captain	end	3_724	Listen to "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_754	Listen to Datalink Chime
1	72.9	approach_initial	First_Officer	end	3_726	Listen to "Confirm Flaps Fifteen"
1	72.9	approach_initial	Captain	end	3_754	Listen to Datalink Chime
1	73.8	approach_initial	Captain	end	3_722	Confirm Flaps "Fifteen"
1	77.1	approach_initial	First_Officer	start	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	end	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	start	3_759	Reach for Lower EICAS
1	78.7	approach_initial	First_Officer	start	3_760	Push button on Lower EICAS to open message
1	78.7	approach_initial	First_Officer	end	3_759	Reach for Lower EICAS
1	79.4	approach_initial	First_Officer	end	3_760	Push button on Lower EICAS to open message
1	79.4	approach_initial	First_Officer	start	3_761	Return hand to Notepad
1	79.6	approach_initial	Captain	start	3_771	Listen to "Datalink message to read"
1	79.6	approach_initial	First_Officer	start	3_763	Reading Datalink Message
1	79.6	approach_initial	First_Officer	end	3_761	Return hand to Notepad
1	79.6	approach_initial	First_Officer	start	3_764	Verbalizing Datalink Message aloud to Captain
1	80.8	approach_initial	Captain	end	3_771	Listen to "Datalink message to read"
1	80.8	approach_initial	First_Officer	end	3_764	Verbalizing Datalink Message aloud to Captain
1	81.1	approach_initial	First_Officer	end	3_763	Reading Datalink Message
1	84.9	approach_initial	Captain	start	3_767	Captain tells FO to "Accept Datalink Message"
1	84.9	approach_initial	First_Officer	start	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	end	3_767	Captain tells FO to "Accept Datalink Message"
1	86	approach_initial	First_Officer	end	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	start	3_781	Reach for Lower EICAS
1	86.4	approach_initial	Captain	start	3_782	Push button on Lower MCP to engate separation automation

1	86.4	approach_initial	Captain	end	3_781	Reach for Lower EICAS
1	87.1	approach_initial	Captain	end	3_782	Push button on Lower MCP to engate separation automation
1	87.1	approach_initial	Captain	start	3_783	Return hand to Notepad
1	87.3	approach_initial	Captain	end	3_783	Return hand to Notepad
1	90.2	approach_initial	First_Officer	start	3_776	Reach for Lower EICAS
1	90.5	approach_initial	First_Officer	start	3_777	Push button on Lower EICAS to accept message
1	90.5	approach_initial	First_Officer	end	3_776	Reach for Lower EICAS
1	91.2	approach_initial	First_Officer	end	3_777	Push button on Lower EICAS to accept message
1	91.2	approach_initial	First_Officer	start	3_778	Return hand to Notepad
1	91.4	approach_initial	First_Officer	end	3_778	Return hand to Notepad
1	94.7	approach_initial	Captain	start	3_59	Call for Flaps 20
1	95.1	approach_initial	Captain	end	3_59	Call for Flaps 20
1	99	approach_initial	First_Officer	start	3_469	OP_listen_to flaps command
1	99.4	approach_initial	First_Officer	end	3_469	OP_listen_to flaps command
1	99.9	approach_initial	First_Officer	start	3_60	Reach for Flaps
1	100.3	approach_initial	Captain	start	3_468	OP_listen_to "Flaps 20"
1	100.3	approach_initial	First_Officer	end	3_60	Reach for Flaps
1	100.3	approach_initial	First_Officer	start	3_205	return hand
1	100.3	approach_initial	First_Officer	start	3_62	Say "Flaps 20"
1	100.3	approach_initial	First_Officer	start	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	end	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	start	3_303	Set Flaps Level on EICAS
1	100.3	approach_initial	First_Officer	end	3_303	Set Flaps Level on EICAS
1	100.5	approach_initial	First_Officer	end	3_205	return hand
1	100.7	approach_initial	First_Officer	end	3_62	Say "Flaps 20"
1	100.9	approach_initial	Captain	end	3_468	OP_listen_to "Flaps 20"
1	105.4	approach_initial	Captain	start	3_680	Confirm Flaps 20
1	105.4	approach_initial	First_Officer	start	3_683	Listen to "Confirm Flaps 20"
1	106.2	approach_initial	First_Officer	end	3_683	Listen to "Confirm Flaps 20"
1	107.4	approach_initial	Captain	start	3_46	Command "Gear Down Landing Checklist
1	107.4	approach_initial	Captain	end	3_680	Confirm Flaps 20
1	107.4	approach_initial	Captain	start	3_242	RH throttle
1	107.7	approach_initial	Captain	end	3_242	RH throttle
1	108.8	approach_initial	Captain	end	3_46	Command "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_470	OP_listen_to "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	end	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	start	3_207	return hand
1	113.2	approach_initial	First_Officer	start	3_808	Set Gear

1	113.2	approach_initial	First_Officer	end	3_808	Set Gear
1	113.5	approach_initial	First_Officer	start	3_548	Display Select Panel
1	113.5	approach_initial	First_Officer	start	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_207	return hand
1	113.8	approach_initial	First_Officer	end	3_548	Display Select Panel
1	113.8	approach_initial	First_Officer	start	3_549	Display Select Panel
1	114.2	approach_initial	First_Officer	end	3_470	OP_listen_to "Gear Down Landing Checklist
1	114.5	approach_initial	First_Officer	end	3_549	Display Select Panel
1	114.5	approach_initial	First_Officer	start	3_555	Return LH to default spot
1	114.8	approach_initial	First_Officer	start	3_551	Check List
1	114.8	approach_initial	First_Officer	end	3_555	Return LH to default spot
1	117.1	approach_initial	First_Officer	start	3_552	Verify
1	117.4	approach_initial	First_Officer	start	3_550	Ack Notification
1	117.4	approach_initial	First_Officer	end	3_552	Verify
1	118.4	approach_initial	First_Officer	start	3_149	Ack Gear Down
1	118.4	approach_initial	First_Officer	end	3_550	Ack Notification
1	118.4	approach_initial	Captain	start	3_467	OP_listen_to Ack of Gear Down
1	118.4	approach_initial	First_Officer	start	3_526	Update EICAS
1	118.4	approach_initial	First_Officer	end	3_526	Update EICAS
1	119	approach_initial	First_Officer	end	3_149	Ack Gear Down
1	119	approach_initial	Captain	end	3_467	OP_listen_to Ack of Gear Down
1	120.7	approach_initial	First_Officer	start	3_552	Verify
1	121.2	approach_initial	First_Officer	start	3_550	Ack Notification
1	121.2	approach_initial	First_Officer	end	3_552	Verify
1	122.2	approach_initial	First_Officer	end	3_550	Ack Notification
1	123.7	approach_initial	Captain	start	3_608	Confirm gear down
1	124.5	approach_initial	First_Officer	end	3_551	Check List
1	124.5	approach_initial	First_Officer	start	3_552	Verify
1	124.7	approach_initial	First_Officer	start	3_550	Ack Notification
1	124.7	approach_initial	First_Officer	end	3_552	Verify
1	125.7	approach_initial	First_Officer	end	3_550	Ack Notification
1	125.7	approach_initial	Captain	end	3_608	Confirm gear down
1	125.7	approach_initial	Captain	start	3_53	Reach speed dial
1	126.1	approach_initial	Captain	end	3_53	Reach speed dial
1	126.1	approach_initial	Captain	start	3_810	Set Target Speed
1	131.1	approach_initial	Captain	start	3_55	Call out Speed
1	131.1	approach_initial	Captain	start	3_381	get altitude to report
1	131.1	approach_initial	Captain	end	3_381	get altitude to report

1	131.1	approach_initial	Captain	start	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	First_Officer	start	3_627	Listen to "Speed is 146 knots"
1	131.1	approach_initial	Captain	start	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_810	Set Target Speed
1	132	approach_initial	Captain	end	3_55	Call out Speed
1	132	approach_initial	First_Officer	end	3_627	Listen to "Speed is 146 knots"
1	136.4	approach_initial	First_Officer	start	3_610	Confirm Speed 146
1	136.4	approach_initial	Captain	start	3_655	Crosscheck speed 146
1	137.4	approach_initial	Captain	end	3_655	Crosscheck speed 146
1	138.4	approach_initial	First_Officer	end	3_610	Confirm Speed 146
1	141.7	approach_initial	Captain	start	3_248	speed brake
1	142	approach_initial	Captain	start	3_249	arm speed brake
1	142	approach_initial	Captain	end	3_248	speed brake
1	142.7	approach_initial	Captain	end	3_249	arm speed brake
1	142.7	approach_initial	Captain	start	3_210	Return Hand
1	142.7	approach_initial	Captain	start	3_511	Update EICAS
1	142.7	approach_initial	Captain	end	3_511	Update EICAS
1	143	approach_initial	First_Officer	start	3_748	Listen to "Checking LNAV and VNAV Mode"
1	143	approach_initial	Captain	start	3_744	LNAV and VNAV Check
1	143	approach_initial	Captain	end	3_210	Return Hand
1	143	approach_initial	Captain	start	3_745	Say "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	First_Officer	end	3_748	Listen to "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	Captain	end	3_745	Say "Checking LNAV and VNAV Mode"
1	144.5	approach_initial	Captain	end	3_744	LNAV and VNAV Check
1	148.4	approach_transitional_1	First_Officer	start	3_750	Confirm LNAV and VNAV Modes
1	148.4	approach_transitional_1	Captain	start	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	149.8	approach_transitional_1	Captain	start	3_253	Command Flaps 25
1	149.8	approach_transitional_1	Captain	end	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	150.2	approach_transitional_1	Captain	end	3_253	Command Flaps 25
1	150.4	approach_transitional_1	First_Officer	end	3_750	Confirm LNAV and VNAV Modes
1	150.4	approach_transitional_1	First_Officer	start	3_656	Listen to Flaps 25
1	150.8	approach_transitional_1	First_Officer	end	3_656	Listen to Flaps 25
1	155.2	approach_transitional_1	First_Officer	start	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	end	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	start	3_231	FO acknowledges "Flaps 25"
1	155.5	approach_transitional_1	Captain	start	3_653	Listen to "Flaps 25"
1	155.5	approach_transitional_1	First_Officer	start	3_258	Return LH to default spot

1	155.5	approach_transitional_1	First_Officer	start	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	end	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	start	3_527	Set Flaps Level on Upper EICAS
1	155.5	approach_transitional_1	First_Officer	end	3_527	Set Flaps Level on Upper EICAS
1	155.7	approach_transitional_1	First_Officer	end	3_258	Return LH to default spot
1	155.9	approach_transitional_1	First_Officer	end	3_231	FO acknowledges "Flaps 25"
1	156.1	approach_transitional_1	Captain	end	3_653	Listen to "Flaps 25"
1	160.6	approach_transitional_1	Captain	start	3_658	Crosscheck Flaps 25
1	160.6	approach_transitional_1	Captain	start	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	Captain	end	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	First_Officer	start	3_667	Listen to Crosscheck
1	161.6	approach_transitional_1	First_Officer	end	3_667	Listen to Crosscheck
1	162.6	approach_transitional_1	Captain	end	3_658	Crosscheck Flaps 25
1	167.7	approach_transitional_1	First_Officer	start	3_660	Flaps 30
1	167.7	approach_transitional_1	First_Officer	start	3_269	Flaps Control
1	168.1	approach_transitional_1	First_Officer	end	3_660	Flaps 30
1	168.1	approach_transitional_1	First_Officer	end	3_269	Flaps Control
1	168.1	approach_transitional_1	Captain	start	3_665	Listen to "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_268	Return LH to default spot
1	168.1	approach_transitional_1	First_Officer	start	3_266	Say "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	end	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	start	3_528	Set Flaps Level on Upper EICAS
1	168.1	approach_transitional_1	First_Officer	end	3_528	Set Flaps Level on Upper EICAS
1	168.3	approach_transitional_1	First_Officer	end	3_268	Return LH to default spot
1	168.5	approach_transitional_1	First_Officer	end	3_266	Say "Flaps 30"
1	168.7	approach_transitional_1	Captain	end	3_665	Listen to "Flaps 30"
1	173.2	approach_transitional_1	Captain	start	3_666	Crosscheck Flaps 30
1	173.2	approach_transitional_1	Captain	start	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	Captain	end	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	First_Officer	start	3_672	Listen to Crosscheck
1	174.1	approach_transitional_1	First_Officer	end	3_672	Listen to Crosscheck
1	175.2	approach_transitional_1	Captain	start	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_666	Crosscheck Flaps 30
1	178.3	approach_transitional_1	First_Officer	start	3_686	Landing Checklist complete
1	178.3	approach_transitional_1	Captain	start	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	Captain	start	3_562	Confirm Roger Landing Checklist complete
1	179.6	approach_transitional_1	First_Officer	end	3_686	Landing Checklist complete

1	179.6	approach_transitional_1	Captain	end	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	First_Officer	start	3_273	radio freq control
1	180	approach_transitional_1	First_Officer	start	3_271	radio freq control
1	180	approach_transitional_1	First_Officer	end	3_273	radio freq control
1	180.7	approach_transitional_1	First_Officer	end	3_271	radio freq control
1	180.7	approach_transitional_1	First_Officer	start	3_272	Return hand
1	180.9	approach_transitional_1	First_Officer	start	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	180.9	approach_transitional_1	First_Officer	end	3_272	Return hand
1	181.2	approach_transitional_1	Captain	end	3_562	Confirm Roger Landing Checklist complete
1	182.7	approach_transitional_1	First_Officer	start	3_280	Listen to
1	182.7	approach_transitional_1	Captain	start	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	182.7	approach_transitional_1	First_Officer	end	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	182.7	default	ATC_Controller	start	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	184	approach_transitional_1	Captain	end	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	184.8	default	ATC_Controller	start	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	184.8	approach_transitional_1	First_Officer	start	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	184.8	approach_transitional_1	First_Officer	end	3_280	Listen to
1	184.8	default	ATC_Controller	end	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	185.1	default	ATC_Controller	end	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	187.4	approach_transitional_1	First_Officer	end	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	207.5	approach_transitional_2	First_Officer	start	3_85	Call out 1000 feet - Instruments Cross Checked
1	207.5	approach_transitional_2	First_Officer	start	3_91	PFD
1	207.5	approach_transitional_2	First_Officer	end	3_91	PFD
1	209.4	approach_transitional_2	First_Officer	end	3_85	Call out 1000 feet - Instruments Cross Checked
1	237.7	default	ATC_Controller		101_79_70	Check ATC display for Yellow Blunder
1	240.7	default	ATC_Controller		101_79_114	ATC Detects Wake on Blunder Display
1	240.7	default	ATC_Controller		101_79_102	ATC Determines MAP
1	240.7	default	ATC_Controller		101_79_126	ATC MAP Plan Expired
1	240.7	default	ATC_Controller		101_79_86	ATC Wake (wind) Comprehended?
1	240.7	default	ATC_Controller		101_79_105	Check ATC display for Red Blunder
1	240.7	default	ATC_Controller		101_79_104	MAP Plan within the past 10 seconds?
1	240.7	default	ATC_Controller		101_79_123	Red Blunder in Progress
1	243.7	land_initial	Captain		100_519	AC Red Blunder Comprehended
1	243.7	land_initial	Captain		100_516	Aircraft in Red Blunder State Detected?
1	243.7	default	ATC_Controller		101_79_109	ATC communicate MA plan to trailing aircraft (routing task)
1	243.7	default	ATC_Controller		101_79_69	ATC Communicates MA to Pilot
1	243.7	default	ATC_Controller		101_79_127	ATC MAP Plan Recent Enough
1	243.7	default	ATC_Controller		101_79_71	ATC to Pilot: "NASA 227 Execute Standard missed approach

					procedure climb to MAO."
1	243.7	land_initial	Captain	100_285	Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions
1	243.7	land_initial	First_Officer	100_528	Listen for Comm from PRN Controller for Traffic Alert and Breakaway Instructions
1	243.7	land_initial	Captain	100_289	Listen to "NASA 227 Execute Standard missed approach procedure climb to MAO.'
1	243.7	land_initial	First_Officer	100_530	Listen to "NASA 227 Execute Standard missed approach procedure climb to MAO.'
1	243.7	default	ATC_Controller	101_79_104	MAP Plan within the past 10 seconds?
1	243.7	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	243.7	land_initial	Captain	100_518	Red Blunder Visible
1	243.7	land_initial	First_Officer	100_686	Routing Task for FO
1	243.7	default	ATC_Controller	101_79_131	Wake Display Detected?
1	243.9	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	244.1	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	244.4	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	244.7	land_initial	First_Officer	100_544	AC Red Blunder Comprehended
1	244.7	land_initial	First_Officer	100_541	Aircraft in Red Blunder State Detected?
1	244.7	land_initial	First_Officer	100_702	Pilots Confirm MA plan (Spatial Compare)
1	244.7	land_initial	First_Officer	100_543	Red Blunder Visible
1	244.8	land_initial	Captain	100_700	Pilots Confirm MA plan (Spatial Compare)
1	244.9	land_initial	First_Officer	100_702	Pilots Confirm MA plan (Spatial Compare)
1	245.1	land_initial	Captain	100_512	CA: "Prepare for standard missed approach procedure..."
1	245.1	land_initial	First_Officer	100_537	CA: "Prepare for standard missed approach procedure..."
1	245.1	land_initial	Captain	100_51	Ensure Single Press of TOGA Button
1	245.1	land_initial	First_Officer	100_685	Hear CA verbalizing MAP; stop all previous tasks and listen
1	245.1	land_initial	First_Officer	100_536	Listen to "Prepare for standard missed approach procedure climb to MAP."
1	245.1	land_initial	Captain	100_45	Press TOGA button if alert is visible
1	245.1	land_initial	Captain	100_33	Press TOGA Button on Thrust Lever
1	245.1	land_initial	Captain	100_699	Routing Task
1	245.1	land_initial	Captain	100_511	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	245.8	land_initial	Captain	100_34	TOGA Button is in Pressed state

Pilot Responsible Two-Stage Alert

RunNumber	Time	Context	Operator	start/end	Task ID	Task Name
1	2.7	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	2.7	descent	First_Officer	start	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	descent	Captain	start	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	default	ATC_Controller	start	101_79_130	Test Delay
1	4.9	default	ATC_Controller	end	101_24	NASA 227 Contact Regional Approach on 118.42.
1	4.9	descent	First_Officer	end	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	4.9	descent	Captain	end	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	5	descent	Captain	start	48_176	Liten to FO acknowledge ATC
1	5	descent	First_Officer	start	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	5	descent	First_Officer	start	48_41	radio freq button
1	5.3	descent	First_Officer	end	48_41	radio freq button
1	5.3	descent	First_Officer	start	48_40	return hand
1	5.3	descent	First_Officer	start	48_196	Set Radio Frequency
1	5.3	descent	First_Officer	end	48_196	Set Radio Frequency
1	5.5	descent	First_Officer	end	48_40	return hand
1	6.6	default	ATC_Controller	start	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	Captain	start	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	start	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	end	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	7.2	descent	Captain	end	48_176	Liten to FO acknowledge ATC
1	8.9	default	ATC_Controller	end	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	Captain	end	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	First_Officer	start	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	Captain	start	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	First_Officer	end	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	8.9	default	ATC_Controller	start	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	First_Officer	end	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"

1	11.6	descent	Captain	end	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	default	ATC_Controller	end	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.7	descent	Captain	start	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	11.7	descent	First_Officer	start	48_72	Say "Roger 4000 for NASA 227"
1	12.7	default	ATC_Controller	end	101_79_130	Test Delay
1	12.9	descent	First_Officer	start	48_93	altitude knob
1	12.9	descent	Captain	end	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	12.9	descent	First_Officer	end	48_72	Say "Roger 4000 for NASA 227"
1	13.3	descent	First_Officer	end	48_93	altitude knob
1	13.3	descent	First_Officer	start	48_94	USER_turn_dial
1	14.9	descent	First_Officer	start	48_92	return hand
1	14.9	descent	First_Officer	end	48_94	USER_turn_dial
1	15.2	descent	Captain	start	48_165	Confirm altitude.
1	15.2	descent	First_Officer	start	48_172	Listen to "Confirm altitude."
1	15.2	descent	First_Officer	end	48_92	return hand
1	16.1	descent	First_Officer	end	48_172	Listen to "Confirm altitude."
1	16.7	default	ATC_Controller	start	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	17.2	descent	Captain	end	48_165	Confirm altitude.
1	17.2	descent	Captain	start	48_134	FLCH on MCP
1	17.7	descent	Captain	end	48_134	FLCH on MCP
1	17.7	descent	Captain	start	48_135	return hand
1	18.2	descent	Captain	end	48_135	return hand
1	21.9	descent	First_Officer	start	48_187	Reach CDU
1	21.9	default	ATC_Controller	end	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	22.1	descent	First_Officer	end	48_187	Reach CDU
1	22.1	descent	First_Officer	start	48_185	Set Touchdown Elevation
1	22.8	descent	First_Officer	start	48_186	Return rleft hand to Notepad
1	22.8	descent	First_Officer	end	48_185	Set Touchdown Elevation
1	23	descent	Captain	start	48_190	Confirm TEZE Set
1	23	descent	First_Officer	end	48_186	Return rleft hand to Notepad
1	25	descent	Captain	end	48_190	Confirm TEZE Set
1	25	descent	First_Officer	start	48_193	Listen to "Crosscheck TEZE Set"
1	25	descent	Captain	start	48_192	Say "Crosscheck TEZE Set"
1	26	descent	First_Officer	end	48_193	Listen to "Crosscheck TEZE Set"
1	26	descent	Captain	end	48_192	Say "Crosscheck TEZE Set"

1	28	approach_initial	Captain	start	3_127	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	28	approach_initial	First_Officer	start	3_373	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	30.1	approach_initial	First_Officer	start	3_10	OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	30.2	approach_initial	Captain	start	3_325	Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	33.2	approach_initial	Captain	end	3_127	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	33.2	approach_initial	First_Officer	end	3_373	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	35.6	approach_initial	First_Officer	start	3_584	altitude knob
1	35.6	approach_initial	Captain	end	3_325	Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	35.6	approach_initial	First_Officer	end	3_10	OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE 124.15 NASA 227"
1	36	approach_initial	First_Officer	end	3_584	altitude knob
1	36	approach_initial	First_Officer	start	3_585	Set altitude to 1800'
1	38	approach_initial	First_Officer	start	3_586	return hand
1	38	approach_initial	First_Officer	end	3_585	Set altitude to 1800'
1	38.2	approach_initial	Captain	start	3_589	Confirm Altitude 1800.
1	38.2	approach_initial	First_Officer	start	3_636	Listen to "Confirm Altitude 1800."
1	38.2	approach_initial	First_Officer	end	3_586	return hand
1	39.3	approach_initial	First_Officer	end	3_636	Listen to "Confirm Altitude 1800."
1	40.2	approach_initial	Captain	end	3_589	Confirm Altitude 1800.
1	40.2	approach_initial	Captain	start	3_350	Reach speed dial
1	40.7	approach_initial	Captain	end	3_350	Reach speed dial
1	40.7	approach_initial	Captain	start	3_809	Set Target Speed
1	45.7	approach_initial	Captain	start	3_375	return hand
1	45.7	approach_initial	Captain	end	3_809	Set Target Speed
1	46	approach_initial	First_Officer	start	3_603	Crosscheck Speed 180
1	46	approach_initial	Captain	start	3_646	Listen to "Crosscheck speed 180"
1	46	approach_initial	First_Officer	start	3_641	Listen to "Set speed 180."
1	46.2	approach_initial	Captain	end	3_375	return hand
1	46.6	approach_initial	First_Officer	end	3_641	Listen to "Set speed 180."

1	46.9	approach_initial	Captain	end	3_646	Listen to "Crosscheck speed 180"
1	47.9	approach_initial	First_Officer	end	3_603	Crosscheck Speed 180
1	51.2	approach_initial	Captain	start	3_351	Flaps One
1	51.2	approach_initial	First_Officer	start	3_598	OP_listen_to Flaps 1 Command
1	51.6	approach_initial	Captain	end	3_351	Flaps One
1	51.6	approach_initial	First_Officer	end	3_598	OP_listen_to Flaps 1 Command
1	56.3	approach_initial	First_Officer	start	3_590	Reach for Flaps
1	56.7	approach_initial	Captain	start	3_649	Listen to "Flaps 1"
1	56.7	approach_initial	First_Officer	end	3_590	Reach for Flaps
1	56.7	approach_initial	First_Officer	start	3_596	return hand
1	56.7	approach_initial	First_Officer	start	3_592	Say "Flaps 1"
1	56.7	approach_initial	First_Officer	start	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	end	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	start	3_597	Set Flaps Level on EICAS to "One"
1	56.7	approach_initial	First_Officer	end	3_597	Set Flaps Level on EICAS to "One"
1	56.9	approach_initial	First_Officer	end	3_596	return hand
1	57.1	approach_initial	Captain	start	3_601	Confirm Flaps "One"
1	57.1	approach_initial	First_Officer	start	3_676	Listen to "Confirm Flaps 1"
1	57.1	approach_initial	Captain	end	3_649	Listen to "Flaps 1"
1	57.2	approach_initial	First_Officer	end	3_592	Say "Flaps 1"
1	58	approach_initial	First_Officer	end	3_676	Listen to "Confirm Flaps 1"
1	59.1	approach_initial	Captain	end	3_601	Confirm Flaps "One"
1	59.1	approach_initial	Captain	start	3_691	Say "Flaps Five"
1	59.6	approach_initial	Captain	end	3_691	Say "Flaps Five"
1	64.2	approach_initial	First_Officer	start	3_700	OP_listen_to Flaps Five Command
1	64.2	approach_initial	First_Officer	start	3_692	Reach for Flaps
1	64.6	approach_initial	Captain	start	3_705	Listen to "Flaps Five"
1	64.6	approach_initial	First_Officer	end	3_692	Reach for Flaps
1	64.6	approach_initial	First_Officer	start	3_698	return hand
1	64.6	approach_initial	First_Officer	start	3_694	Say "Flaps Five"
1	64.6	approach_initial	First_Officer	start	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	end	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	start	3_699	Set Flaps Level on EICAS to "5"
1	64.6	approach_initial	First_Officer	end	3_699	Set Flaps Level on EICAS to "5"
1	64.7	approach_initial	First_Officer	end	3_700	OP_listen_to Flaps Five Command
1	64.8	approach_initial	First_Officer	end	3_698	return hand
1	65.1	approach_initial	First_Officer	end	3_694	Say "Flaps Five"
1	65.3	approach_initial	Captain	start	3_703	Confirm Flaps "Five"
1	65.3	approach_initial	First_Officer	start	3_707	Listen to "Confirm Flaps Five"

1	65.3	approach_initial	Captain	end	3_705	Listen to "Flaps Five"
1	65.3	approach_initial	Captain	start	3_710	Say "Flaps Fifteen"
1	66	approach_initial	First_Officer	end	3_707	Listen to "Confirm Flaps Five"
1	66	approach_initial	Captain	end	3_710	Say "Flaps Fifteen"
1	67.3	approach_initial	Captain	end	3_703	Confirm Flaps "Five"
1	70.6	approach_initial	First_Officer	start	3_719	OP_listen_to Flaps Fifteen Command
1	70.6	approach_initial	First_Officer	start	3_711	Reach for Flaps
1	70.9	approach_initial	Captain	start	3_724	Listen to "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	end	3_711	Reach for Flaps
1	70.9	approach_initial	First_Officer	start	3_717	return hand
1	70.9	approach_initial	First_Officer	start	3_713	Say "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	start	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	end	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	start	3_718	Set Flaps Level on EICAS to "15"
1	70.9	approach_initial	First_Officer	end	3_718	Set Flaps Level on EICAS to "15"
1	71.1	approach_initial	First_Officer	end	3_717	return hand
1	71.2	approach_initial	First_Officer	end	3_719	OP_listen_to Flaps Fifteen Command
1	71.6	approach_initial	First_Officer	end	3_713	Say "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_722	Confirm Flaps "Fifteen"
1	71.8	approach_initial	First_Officer	start	3_726	Listen to "Confirm Flaps Fifteen"
1	71.8	approach_initial	Captain	end	3_724	Listen to "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_754	Listen to Datalink Chime
1	72.9	approach_initial	First_Officer	end	3_726	Listen to "Confirm Flaps Fifteen"
1	72.9	approach_initial	Captain	end	3_754	Listen to Datalink Chime
1	73.8	approach_initial	Captain	end	3_722	Confirm Flaps "Fifteen"
1	77.1	approach_initial	First_Officer	start	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	end	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	start	3_759	Reach for Lower EICAS
1	78.7	approach_initial	First_Officer	start	3_760	Push button on Lower EICAS to open message
1	78.7	approach_initial	First_Officer	end	3_759	Reach for Lower EICAS
1	79.4	approach_initial	First_Officer	end	3_760	Push button on Lower EICAS to open message
1	79.4	approach_initial	First_Officer	start	3_761	Return hand to Notepad
1	79.6	approach_initial	Captain	start	3_771	Listen to "Datalink message to read"
1	79.6	approach_initial	First_Officer	start	3_763	Reading Datalink Message
1	79.6	approach_initial	First_Officer	end	3_761	Return hand to Notepad
1	79.6	approach_initial	First_Officer	start	3_764	Verbalizing Datalink Message aloud to Captain
1	80.8	approach_initial	Captain	end	3_771	Listen to "Datalink message to read"
1	80.8	approach_initial	First_Officer	end	3_764	Verbalizing Datalink Message aloud to Captain
1	81.1	approach_initial	First_Officer	end	3_763	Reading Datalink Message

1	84.9	approach_initial	Captain	start	3_767	Captain tells FO to "Accept Datalink Message"
1	84.9	approach_initial	First_Officer	start	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	end	3_767	Captain tells FO to "Accept Datalink Message"
1	86	approach_initial	First_Officer	end	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	start	3_781	Reach for Lower EICAS
1	86.4	approach_initial	Captain	start	3_782	Push button on Lower MCP to engate separation automation
1	86.4	approach_initial	Captain	end	3_781	Reach for Lower EICAS
1	87.1	approach_initial	Captain	end	3_782	Push button on Lower MCP to engate separation automation
1	87.1	approach_initial	Captain	start	3_783	Return hand to Notepad
1	87.3	approach_initial	Captain	end	3_783	Return hand to Notepad
1	90.2	approach_initial	First_Officer	start	3_776	Reach for Lower EICAS
1	90.5	approach_initial	First_Officer	start	3_777	Push button on Lower EICAS to accept message
1	90.5	approach_initial	First_Officer	end	3_776	Reach for Lower EICAS
1	91.2	approach_initial	First_Officer	end	3_777	Push button on Lower EICAS to accept message
1	91.2	approach_initial	First_Officer	start	3_778	Return hand to Notepad
1	91.4	approach_initial	First_Officer	end	3_778	Return hand to Notepad
1	94.7	approach_initial	Captain	start	3_59	Call for Flaps 20
1	95.1	approach_initial	Captain	end	3_59	Call for Flaps 20
1	99	approach_initial	First_Officer	start	3_469	OP_listen_to flaps command
1	99.4	approach_initial	First_Officer	end	3_469	OP_listen_to flaps command
1	99.9	approach_initial	First_Officer	start	3_60	Reach for Flaps
1	100.3	approach_initial	Captain	start	3_468	OP_listen_to "Flaps 20"
1	100.3	approach_initial	First_Officer	end	3_60	Reach for Flaps
1	100.3	approach_initial	First_Officer	start	3_205	return hand
1	100.3	approach_initial	First_Officer	start	3_62	Say "Flaps 20"
1	100.3	approach_initial	First_Officer	start	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	end	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	start	3_303	Set Flaps Level on EICAS
1	100.3	approach_initial	First_Officer	end	3_303	Set Flaps Level on EICAS
1	100.5	approach_initial	First_Officer	end	3_205	return hand
1	100.7	approach_initial	First_Officer	end	3_62	Say "Flaps 20"
1	100.9	approach_initial	Captain	end	3_468	OP_listen_to "Flaps 20"
1	105.4	approach_initial	Captain	start	3_680	Confirm Flaps 20
1	105.4	approach_initial	First_Officer	start	3_683	Listen to "Confirm Flaps 20"
1	106.2	approach_initial	First_Officer	end	3_683	Listen to "Confirm Flaps 20"
1	107.4	approach_initial	Captain	start	3_46	Command "Gear Down Landing Checklist
1	107.4	approach_initial	Captain	end	3_680	Confirm Flaps 20
1	107.4	approach_initial	Captain	start	3_242	RH throttle

1	107.7	approach_initial	Captain	end	3_242	RH throttle
1	108.8	approach_initial	Captain	end	3_46	Command "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_470	OP_listen_to "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	end	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	start	3_207	return hand
1	113.2	approach_initial	First_Officer	start	3_808	Set Gear
1	113.2	approach_initial	First_Officer	end	3_808	Set Gear
1	113.5	approach_initial	First_Officer	start	3_548	Display Select Panel
1	113.5	approach_initial	First_Officer	start	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_207	return hand
1	113.8	approach_initial	First_Officer	end	3_548	Display Select Panel
1	113.8	approach_initial	First_Officer	start	3_549	Display Select Panel
1	114.2	approach_initial	First_Officer	end	3_470	OP_listen_to "Gear Down Landing Checklist
1	114.5	approach_initial	First_Officer	end	3_549	Display Select Panel
1	114.5	approach_initial	First_Officer	start	3_555	Return LH to default spot
1	114.8	approach_initial	First_Officer	start	3_551	Check List
1	114.8	approach_initial	First_Officer	end	3_555	Return LH to default spot
1	117.1	approach_initial	First_Officer	end	3_551	Check List
1	117.1	approach_initial	First_Officer	start	3_552	Verify
1	117.4	approach_initial	First_Officer	start	3_550	Ack Notification
1	117.4	approach_initial	First_Officer	end	3_552	Verify
1	118.4	approach_initial	First_Officer	start	3_149	Ack Gear Down
1	118.4	approach_initial	First_Officer	end	3_550	Ack Notification
1	118.4	approach_initial	First_Officer	start	3_551	Check List
1	118.4	approach_initial	Captain	start	3_467	OP_listen_to Ack of Gear Down
1	118.4	approach_initial	First_Officer	start	3_152	Set Landing Gear Indicator
1	118.4	approach_initial	First_Officer	end	3_152	Set Landing Gear Indicator
1	118.4	approach_initial	First_Officer	start	3_526	Update EICAS
1	118.4	approach_initial	First_Officer	end	3_526	Update EICAS
1	119	approach_initial	First_Officer	end	3_149	Ack Gear Down
1	119	approach_initial	Captain	end	3_467	OP_listen_to Ack of Gear Down
1	120.7	approach_initial	First_Officer	end	3_551	Check List
1	120.7	approach_initial	First_Officer	start	3_552	Verify
1	121.2	approach_initial	First_Officer	start	3_550	Ack Notification
1	121.2	approach_initial	First_Officer	end	3_552	Verify
1	122.2	approach_initial	First_Officer	end	3_550	Ack Notification
1	122.2	approach_initial	First_Officer	start	3_551	Check List

1	123.7	approach_initial	Captain	start	3_608	Confirm gear down
1	124.5	approach_initial	First_Officer	end	3_551	Check List
1	124.5	approach_initial	First_Officer	start	3_552	Verify
1	124.7	approach_initial	First_Officer	start	3_550	Ack Notification
1	124.7	approach_initial	First_Officer	end	3_552	Verify
1	125.7	approach_initial	First_Officer	end	3_550	Ack Notification
1	125.7	approach_initial	Captain	end	3_608	Confirm gear down
1	125.7	approach_initial	Captain	start	3_53	Reach speed dial
1	126.1	approach_initial	Captain	end	3_53	Reach speed dial
1	126.1	approach_initial	Captain	start	3_810	Set Target Speed
1	131.1	approach_initial	Captain	start	3_55	Call out Speed
1	131.1	approach_initial	Captain	start	3_381	get altitude to report
1	131.1	approach_initial	Captain	end	3_381	get altitude to report
1	131.1	approach_initial	Captain	start	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_510	Left MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	First_Officer	start	3_627	Listen to "Speed is 146 knots"
1	131.1	approach_initial	Captain	start	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_810	Set Target Speed
1	132	approach_initial	Captain	end	3_55	Call out Speed
1	132	approach_initial	First_Officer	end	3_627	Listen to "Speed is 146 knots"
1	136.4	approach_initial	First_Officer	start	3_610	Confirm Speed 146
1	136.4	approach_initial	Captain	start	3_655	Crosscheck speed 146
1	137.4	approach_initial	Captain	end	3_655	Crosscheck speed 146
1	138.4	approach_initial	First_Officer	end	3_610	Confirm Speed 146
1	141.7	approach_initial	Captain	start	3_248	speed brake
1	142	approach_initial	Captain	start	3_249	arm speed brake
1	142	approach_initial	Captain	end	3_248	speed brake
1	142.7	approach_initial	Captain	end	3_249	arm speed brake
1	142.7	approach_initial	Captain	start	3_210	Return Hand
1	142.7	approach_initial	Captain	start	3_511	Update EICAS
1	142.7	approach_initial	Captain	end	3_511	Update EICAS
1	143	approach_initial	First_Officer	start	3_748	Listen to "Checking LNAV and VNAV Mode"
1	143	approach_initial	Captain	start	3_744	LNAV and VNAV Check
1	143	approach_initial	Captain	end	3_210	Return Hand
1	143	approach_initial	Captain	start	3_745	Say "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	First_Officer	end	3_748	Listen to "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	Captain	end	3_745	Say "Checking LNAV and VNAV Mode"
1	144.5	approach_initial	Captain	end	3_744	LNAV and VNAV Check

1	148.4	approach_transitional_1	First_Officer	start	3_750	Confirm LNAV and VNAV Modes
1	148.4	approach_transitional_1	Captain	start	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	149.8	approach_transitional_1	Captain	start	3_253	Command Flaps 25
1	149.8	approach_transitional_1	Captain	end	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	150.2	approach_transitional_1	Captain	end	3_253	Command Flaps 25
1	150.4	approach_transitional_1	First_Officer	end	3_750	Confirm LNAV and VNAV Modes
1	150.4	approach_transitional_1	First_Officer	start	3_656	Listen to Flaps 25
1	150.8	approach_transitional_1	First_Officer	end	3_656	Listen to Flaps 25
1	155.2	approach_transitional_1	First_Officer	start	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	end	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	start	3_231	FO acknowledges "Flaps 25"
1	155.5	approach_transitional_1	Captain	start	3_653	Listen to "Flaps 25"
1	155.5	approach_transitional_1	First_Officer	start	3_258	Return LH to default spot
1	155.5	approach_transitional_1	First_Officer	start	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	end	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	start	3_527	Set Flaps Level on Upper EICAS
1	155.5	approach_transitional_1	First_Officer	end	3_527	Set Flaps Level on Upper EICAS
1	155.7	approach_transitional_1	First_Officer	end	3_258	Return LH to default spot
1	155.9	approach_transitional_1	First_Officer	end	3_231	FO acknowledges "Flaps 25"
1	156.1	approach_transitional_1	Captain	end	3_653	Listen to "Flaps 25"
1	160.6	approach_transitional_1	Captain	start	3_658	Crosscheck Flaps 25
1	160.6	approach_transitional_1	Captain	start	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	Captain	end	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	First_Officer	start	3_667	Listen to Crosscheck
1	161.6	approach_transitional_1	First_Officer	end	3_667	Listen to Crosscheck
1	162.6	approach_transitional_1	Captain	end	3_658	Crosscheck Flaps 25
1	167.7	approach_transitional_1	First_Officer	start	3_660	Flaps 30
1	167.7	approach_transitional_1	First_Officer	start	3_269	Flaps Control
1	168.1	approach_transitional_1	First_Officer	end	3_660	Flaps 30
1	168.1	approach_transitional_1	First_Officer	end	3_269	Flaps Control
1	168.1	approach_transitional_1	Captain	start	3_665	Listen to "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_268	Return LH to default spot
1	168.1	approach_transitional_1	First_Officer	start	3_266	Say "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	end	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	start	3_528	Set Flaps Level on Upper EICAS
1	168.1	approach_transitional_1	First_Officer	end	3_528	Set Flaps Level on Upper EICAS
1	168.3	approach_transitional_1	First_Officer	end	3_268	Return LH to default spot
1	168.5	approach_transitional_1	First_Officer	end	3_266	Say "Flaps 30"

1	168.7	approach_transitional_1	Captain	end	3_665	Listen to "Flaps 30"
1	173.2	approach_transitional_1	Captain	start	3_666	Crosscheck Flaps 30
1	173.2	approach_transitional_1	Captain	start	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	Captain	end	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	First_Officer	start	3_672	Listen to Crosscheck
1	174.1	approach_transitional_1	First_Officer	end	3_672	Listen to Crosscheck
1	175.2	approach_transitional_1	Captain	start	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_254	checklist done?
1	175.2	approach_transitional_1	Captain	end	3_666	Crosscheck Flaps 30
1	178.3	approach_transitional_1	First_Officer	start	3_686	Landing Checklist complete
1	178.3	approach_transitional_1	Captain	start	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	Captain	start	3_562	Confirm Roger Landing Checklist complete
1	179.6	approach_transitional_1	First_Officer	end	3_686	Landing Checklist complete
1	179.6	approach_transitional_1	Captain	end	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	First_Officer	start	3_273	radio freq control
1	180	approach_transitional_1	First_Officer	start	3_271	radio freq control
1	180	approach_transitional_1	First_Officer	end	3_273	radio freq control
1	180.7	approach_transitional_1	First_Officer	end	3_271	radio freq control
1	180.7	approach_transitional_1	First_Officer	start	3_272	Return hand
1	180.9	approach_transitional_1	First_Officer	start	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	180.9	approach_transitional_1	First_Officer	end	3_272	Return hand
1	181.2	approach_transitional_1	Captain	end	3_562	Confirm Roger Landing Checklist complete
1	182.7	approach_transitional_1	First_Officer	start	3_280	Listen to
1	182.7	approach_transitional_1	Captain	start	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	182.7	approach_transitional_1	First_Officer	end	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	182.7	default	ATC_Controller	start	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	184	approach_transitional_1	Captain	end	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	184.8	default	ATC_Controller	start	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	184.8	approach_transitional_1	First_Officer	start	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	184.8	approach_transitional_1	First_Officer	end	3_280	Listen to
1	184.8	default	ATC_Controller	end	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	185.1	default	ATC_Controller	end	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	187.4	approach_transitional_1	First_Officer	end	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	204.8	approach_transitional_2	First_Officer	start	3_85	Call out 1000 feet - Instruments Cross Checked

1	204.8	approach_transitional_2	First_Officer	start	3_91	PFD
1	204.8	approach_transitional_2	First_Officer	end	3_91	PFD
1	206.7	approach_transitional_2	First_Officer	end	3_85	Call out 1000 feet - Instruments Cross Checked
1	221.7	approach_final	Captain	start	100_443	Assign Entities the Color "Yellow"
1	221.7	approach_final	Captain	end	100_443	Assign Entities the Color "Yellow"
1	221.7	approach_final	First_Officer	start	100_444	Assign Entities the Color "Yellow"
1	221.7	approach_final	First_Officer	end	100_444	Assign Entities the Color "Yellow"
1	221.7	approach_final	Captain	start	100_421	Count 2 displays to comprehend
1	221.7	approach_final	First_Officer	start	100_431	Count 2 displays to comprehend
1	221.7	approach_final	Captain	start	100_70	Show CA Yellow Aircraft Blunder Display
1	221.7	approach_final	Captain	end	100_70	Show CA Yellow Aircraft Blunder Display
1	221.7	approach_final	First_Officer	start	100_84	Show FO Yellow Aircraft Blunder Display
1	221.7	approach_final	First_Officer	end	100_84	Show FO Yellow Aircraft Blunder Display
1	221.7	approach_final	First_Officer	start	100_447	Test Routing Task
1	222.2	approach_final	First_Officer	start	100_457	Do not release if CA sees yellow first
1	222.2	approach_final	First_Officer	end	100_457	Do not release if CA sees yellow first
1	222.2	approach_final	First_Officer	start	100_455	FO advises CA of seeing Yellow Blunder
1	222.2	approach_final	First_Officer	end	100_455	FO advises CA of seeing Yellow Blunder
1	222.2	approach_final	First_Officer	start	100_456	FO_Sees_Yellow
1	222.2	approach_final	First_Officer	end	100_456	FO_Sees_Yellow
1	222.2	approach_final	Captain	start	100_100	Listen To "CA Yellow Blunder Alert" from FO
1	222.2	approach_final	First_Officer	start	100_454	Say to CA "CA Yellow Blunder Alert
1	222.5	approach_final	Captain	start	100_451	CA_Sees_Yellow
1	222.5	approach_final	Captain	end	100_451	CA_Sees_Yellow
1	222.5	approach_final	Captain	start	100_592	Listen To "CA Yellow Blunder Alert" from FO
1	222.5	approach_final	First_Officer	start	100_593	Release if CA sees yellow first
1	222.5	approach_final	First_Officer	end	100_593	Release if CA sees yellow first
1	222.5	approach_final	Captain	start	100_589	Release if FO sees yellow first
1	222.5	approach_final	Captain	end	100_589	Release if FO sees yellow first
1	223.4	approach_final	Captain	end	100_100	Listen To "CA Yellow Blunder Alert" from FO
1	223.4	approach_final	First_Officer	end	100_454	Say to CA "CA Yellow Blunder Alert
1	223.7	approach_final	Captain	end	100_592	Listen To "CA Yellow Blunder Alert" from FO
1	227.2	approach_final	First_Officer	start	100_465	Confirm that ND and OTW match (Spatial Compare)
1	227.2	approach_final	First_Officer	start	100_429	Yellow Blunder Visible
1	227.2	approach_final	First_Officer	end	100_429	Yellow Blunder Visible
1	228.6	approach_final	Captain	start	100_458	Confirm that ND and OTW match (Spatial Compare)
1	228.6	approach_final	Captain	start	100_90	Yellow Blunder Visible
1	228.6	approach_final	Captain	end	100_90	Yellow Blunder Visible
1	231.3	land_initial	Captain	start	100_461	CA: "Prepare for standard missed approach

						procedure..."
1	231.3	land_initial	Captain	end	100_461	CA: "Prepare for standard missed approach procedure..."
1	231.3	land_initial	Captain	start	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	234.4	land_initial	Captain	start	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	234.4	land_initial	First_Officer	start	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	234.4	land_initial	Captain	end	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	237.2	land_initial	Captain	start	100_450	CA advises FO of seeing Yellow Blunder
1	237.2	land_initial	Captain	end	100_450	CA advises FO of seeing Yellow Blunder
1	237.2	land_initial	Captain	start	100_451	CA_Sees_Yellow
1	237.2	land_initial	Captain	end	100_451	CA_Sees_Yellow
1	237.2	land_initial	Captain	end	100_421	Count 2 displays to comprehend
1	237.2	land_initial	First_Officer	end	100_431	Count 2 displays to comprehend
1	237.2	land_initial	Captain	start	100_485	Declare Time of MAP Comms Finished Reset variables
1	237.2	land_initial	Captain	end	100_485	Declare Time of MAP Comms Finished Reset variables
1	237.2	land_initial	Captain	start	100_452	Do not release if FO sees yellow first
1	237.2	land_initial	Captain	end	100_452	Do not release if FO sees yellow first
1	237.2	land_initial	First_Officer	start	100_456	FO_Sees_Yellow
1	237.2	land_initial	First_Officer	end	100_456	FO_Sees_Yellow
1	237.2	land_initial	First_Officer	start	100_596	Listen To "FO Yellow Blunder Alert" from CA
1	237.2	land_initial	First_Officer	start	100_596	Listen To "FO Yellow Blunder Alert" from CA
1	237.2	land_initial	Captain	end	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	237.2	land_initial	First_Officer	start	100_107	Listen To "Yellow Blunder Alert" from CA
1	237.2	land_initial	First_Officer	start	100_593	Release if CA sees yellow first
1	237.2	land_initial	First_Officer	end	100_593	Release if CA sees yellow first
1	237.2	land_initial	Captain	start	100_589	Release if FO sees yellow first
1	237.2	land_initial	Captain	end	100_589	Release if FO sees yellow first
1	237.2	land_initial	Captain	start	100_607	Route for red or yellow status
1	237.2	land_initial	Captain	end	100_607	Route for red or yellow status
1	237.2	land_initial	First_Officer	start	100_608	Route for red or yellow status
1	237.2	land_initial	First_Officer	end	100_608	Route for red or yellow status
1	237.2	land_initial	First_Officer	end	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	237.2	land_initial	Captain	start	100_449	Say to FO "Yellow Blunder Alert
1	237.2	land_initial	First_Officer	start	100_429	Yellow Blunder Visible
1	237.2	land_initial	First_Officer	end	100_429	Yellow Blunder Visible

1	237.2	land_initial	Captain	start	100_90	Yellow Blunder Visible
1	237.2	land_initial	Captain	end	100_90	Yellow Blunder Visible
1	238.4	land_initial	First_Officer	end	100_596	Listen To "FO Yellow Blunder Alert" from CA
1	238.4	land_initial	First_Officer	end	100_596	Listen To "FO Yellow Blunder Alert" from CA
1	238.4	land_initial	First_Officer	end	100_107	Listen To "Yellow Blunder Alert" from CA
1	238.4	land_initial	Captain	end	100_449	Say to FO "Yellow Blunder Alert
1	239.3	land_initial	Captain	start	100_461	CA: "Prepare for standard missed approach procedure..."
1	239.3	land_initial	Captain	end	100_461	CA: "Prepare for standard missed approach procedure..."
1	239.3	land_initial	Captain	start	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	241.7	land_initial	Captain	start	52_238	OP_listen_to FO to say "500 feet"
1	241.7	land_initial	First_Officer	start	52_249	OP_listen_to headset 500 feet
1	242.1	land_initial	Captain	end	52_238	OP_listen_to FO to say "500 feet"
1	242.1	land_initial	First_Officer	end	52_249	OP_listen_to headset 500 feet
1	242.4	land_initial	Captain	end	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	242.7	land_initial	Captain	start	100_445	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.7	land_initial	Captain	end	100_445	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.7	land_initial	First_Officer	start	100_446	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.7	land_initial	First_Officer	end	100_446	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.7	land_initial	Captain	start	100_424	Count 2 displays to comprehend
1	242.7	land_initial	Captain	end	100_424	Count 2 displays to comprehend
1	242.7	land_initial	First_Officer	start	100_556	Count 2 displays to comprehend
1	242.7	land_initial	Captain	start	100_77	Listen To
1	242.7	land_initial	Captain	end	100_77	Listen To
1	242.7	land_initial	First_Officer	start	100_78	Listen To
1	242.7	land_initial	First_Officer	end	100_78	Listen To
1	242.7	land_initial	Captain	start	100_489	MAP Comm within the past 5 seconds?
1	242.7	land_initial	Captain	end	100_489	MAP Comm within the past 5 seconds?
1	242.7	land_initial	First_Officer	start	100_557	MAP Comm within the past 5 seconds?
1	242.7	land_initial	First_Officer	end	100_557	MAP Comm within the past 5 seconds?
1	242.7	land_initial	First_Officer	start	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	242.7	land_initial	Captain	start	100_71	Show CA Red Aircraft Blunder Display
1	242.7	land_initial	Captain	end	100_71	Show CA Red Aircraft Blunder Display
1	242.7	land_initial	First_Officer	start	100_86	Show FO Red Aircraft Blunder Display
1	242.7	land_initial	First_Officer	end	100_86	Show FO Red Aircraft Blunder Display

1	243.3	land_initial	Captain	start	100_476	CA advises FO of seeing Red Blunder
1	243.3	land_initial	Captain	end	100_476	CA advises FO of seeing Red Blunder
1	243.3	land_initial	Captain	start	100_477	CA_Sees_Red Stop all "aqua" entities in regular procedures
1	243.3	land_initial	Captain	end	100_477	CA_Sees_Red Stop all "aqua" entities in regular procedures
1	243.3	land_initial	Captain	start	100_478	Do not release if FO sees red first
1	243.3	land_initial	Captain	end	100_478	Do not release if FO sees red first
1	243.3	land_initial	First_Officer	start	100_584	Listen To "Red Blunder Alert" from CA
1	243.3	land_initial	Captain	start	100_475	Say to FO "FO Red Blunder Alert
1	243.4	land_initial	First_Officer	start	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	243.4	land_initial	First_Officer	end	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	243.4	land_initial	First_Officer	start	100_600	Listen To "FO Red Blunder Alert" from CA
1	243.4	land_initial	First_Officer	start	100_597	Release if CA sees red first
1	243.4	land_initial	First_Officer	end	100_597	Release if CA sees red first
1	243.4	land_initial	Captain	start	100_585	Release if FO sees red first
1	243.4	land_initial	Captain	end	100_585	Release if FO sees red first
1	244.3	land_initial	First_Officer	end	100_584	Listen To "Red Blunder Alert" from CA
1	244.3	land_initial	Captain	end	100_475	Say to FO "FO Red Blunder Alert
1	244.4	land_initial	First_Officer	end	100_600	Listen To "FO Red Blunder Alert" from CA
1	253.4	land_initial	First_Officer	start	100_438	Red Blunder Visible
1	253.4	land_initial	First_Officer	end	100_438	Red Blunder Visible
1	258.1	land_initial	Captain	start	100_51	Ensure Single Press of TOGA Button
1	258.1	land_initial	Captain	end	100_51	Ensure Single Press of TOGA Button
1	258.1	land_initial	Captain	start	100_45	Press TOGA button if alert is visible
1	258.1	land_initial	Captain	end	100_45	Press TOGA button if alert is visible
1	258.1	land_initial	Captain	start	100_33	Press TOGA Button on Thrust Lever
1	258.1	land_initial	Captain	start	100_425	Red Blunder Visible
1	258.1	land_initial	Captain	end	100_425	Red Blunder Visible
1	258.3	land_initial	Captain	start	100_461	CA: "Prepare for standard missed approach procedure..."
1	258.3	land_initial	Captain	end	100_461	CA: "Prepare for standard missed approach procedure..."
1	258.3	land_initial	Captain	end	100_458	Confirm that ND and OTW match (Spatial Compare)
1	258.3	land_initial	Captain	start	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	258.8	land_initial	Captain	end	100_33	Press TOGA Button on Thrust Lever
1	261.5	land_initial	First_Officer	start	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	264.3	land_final	First_Officer	end	100_556	Count 2 displays to comprehend

1	264.3	land_final	First_Officer	start	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	264.3	land_final	First_Officer	end	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	264.3	land_final	Captain	start	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	264.3	land_final	First_Officer	start	100_557	MAP Comm within the past 5 seconds?
1	264.3	land_final	First_Officer	end	100_557	MAP Comm within the past 5 seconds?
1	264.3	land_final	First_Officer	start	100_438	Red Blunder Visible
1	264.3	land_final	First_Officer	end	100_438	Red Blunder Visible
1	264.3	land_final	First_Officer	start	100_597	Release if CA sees red first
1	264.3	land_final	First_Officer	end	100_597	Release if CA sees red first
1	264.3	land_final	First_Officer	start	100_608	Route for red or yellow status
1	264.3	land_final	First_Officer	end	100_608	Route for red or yellow status
1	264.3	land_final	First_Officer	end	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	264.3	land_final	Captain	end	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	266.6	land_final	First_Officer	end	100_465	Confirm that ND and OTW match (Spatial Compare)
1	267.1	land_final	Captain	start	100_485	Declare Time of MAP Comms Finished Reset variables
1	267.1	land_final	Captain	end	100_485	Declare Time of MAP Comms Finished Reset variables
1	267.1	land_final	Captain	end	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	278.8	default	ATC_Controller	start	101_73	Assign entities the color "aqua"
1	278.8	default	ATC_Controller	end	101_73	Assign entities the color "aqua"
1	278.8	default	ATC_Controller	start	101_63	ATC Tasks
1	278.8	default	ATC_Controller	end	101_63	ATC Tasks
1	278.8	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	278.8	default	ATC_Controller	start	101_79_130	Test Delay

Pilot Responsible – One-Stage Alert

RunNumber	Time	Context	Operator	start/end	Task ID	Task Name
1	0.1	descent	Captain	start	32_2	Default LH to yoke
1	0.1	descent	Captain	start	32_3	Default RH to Thrust Lever
1	0.3	descent	Captain	end	32_3	Default RH to Thrust Lever
1	0.5	descent	Captain	end	32_2	Default LH to yoke
1	2.7	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	2.7	default	ATC_Controller	start	101_79_130	Test Delay
1	2.7	descent	First_Officer	start	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	2.7	descent	Captain	start	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	4.9	default	ATC_Controller	end	101_24	NASA 227 Contact Regional Approach on 118.42.
1	4.9	descent	First_Officer	end	48_30	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	4.9	descent	Captain	end	48_34	OP_listen_to "NASA 227 contact Regional Approach on 118.42"
1	5	descent	Captain	start	48_176	Liten to FO acknowledge ATC
1	5	descent	First_Officer	start	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	5	descent	First_Officer	start	48_41	radio freq button
1	5.3	descent	First_Officer	start	48_196	Set Radio Frequency
1	5.3	descent	First_Officer	end	48_196	Set Radio Frequency
1	5.3	descent	First_Officer	start	48_40	return hand
1	5.3	descent	First_Officer	end	48_41	radio freq button
1	5.5	descent	First_Officer	end	48_40	return hand
1	6.6	default	ATC_Controller	start	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	Captain	start	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	start	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	6.6	descent	First_Officer	end	48_38	OP_say_message "Roger 118.42 NASA 227 good day"
1	7.2	descent	Captain	end	48_176	Liten to FO acknowledge ATC
1	8.9	default	ATC_Controller	start	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	default	ATC_Controller	end	101_76	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	Captain	end	48_178	Op_listen_to "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	First_Officer	end	48_37	OP_say_message "Regional Approach NASA 227 with you at 10000"
1	8.9	descent	First_Officer	start	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	8.9	descent	Captain	start	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	default	ATC_Controller	end	101_35	Say "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	First_Officer	end	48_44	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"
1	11.6	descent	Captain	end	48_48	OP_listen_to "Roger NASA 227 descend and maintain flight level 4000"

1	11.7	descent	Captain	start	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	11.7	descent	First_Officer	start	48_72	Say "Roger 4000 for NASA 227"
1	12.7	default	ATC_Controller	end	101_79_130	Test Delay
1	12.9	descent	Captain	end	48_102	OP_listen_to "Roger 4000 for NASA 227"
1	12.9	descent	First_Officer	end	48_72	Say "Roger 4000 for NASA 227"
1	12.9	descent	First_Officer	start	48_93	altitude knob
1	13.3	descent	First_Officer	end	48_93	altitude knob
1	13.3	descent	First_Officer	start	48_94	USER_turn_dial
1	14.9	descent	First_Officer	start	48_92	return hand
1	14.9	descent	First_Officer	end	48_94	USER_turn_dial
1	15.2	descent	Captain	start	48_165	Confirm altitude.
1	15.2	descent	First_Officer	start	48_172	Listen to "Confirm altitude."
1	15.2	descent	First_Officer	end	48_92	return hand
1	16.1	descent	First_Officer	end	48_172	Listen to "Confirm altitude."
1	16.7	default	ATC_Controller	start	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	17.2	descent	Captain	start	48_134	FLCH on MCP
1	17.2	descent	Captain	end	48_165	Confirm altitude.
1	17.7	descent	Captain	end	48_134	FLCH on MCP
1	17.7	descent	Captain	start	48_135	return hand
1	18.2	descent	Captain	end	48_135	return hand
1	21.9	default	ATC_Controller	end	101_31	Say "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R Approach contact Tower at NETEE on 124.15"
1	21.9	descent	First_Officer	start	48_187	Reach CDU
1	22.1	descent	First_Officer	start	48_185	Set Touchdown Elevation
1	22.1	descent	First_Officer	end	48_187	Reach CDU
1	22.8	descent	First_Officer	end	48_185	Set Touchdown Elevation
1	22.8	descent	First_Officer	start	48_186	Return rleft hand to Notepad
1	23	descent	First_Officer	end	48_186	Return rleft hand to Notepad
1	23	descent	Captain	start	48_190	Confirm TEZE Set
1	25	descent	Captain	end	48_190	Confirm TEZE Set
1	25	descent	Captain	start	48_192	Say "Crosscheck TEZE Set"
1	25	descent	First_Officer	start	48_193	Listen to "Crosscheck TEZE Set"
1	26	descent	Captain	end	48_192	Say "Crosscheck TEZE Set"
1	26	descent	First_Officer	end	48_193	Listen to "Crosscheck TEZE Set" OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	28	approach_initial	Captain	start	3_127	Approach contact Tower at NETEE on 124.15"
1	28	approach_initial	First_Officer	start	3_373	OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the

						RNAV 18R
						Approach contact Tower at NETEE on 124.15"
						OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	30.1	approach_initial	First_Officer	start	3_10	Approach contact Tower at NETEE 124.15 NASA 227"
						Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	30.2	approach_initial	Captain	start	3_325	Approach contact Tower at NETEE 124.15 NASA 227"
						OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	33.2	approach_initial	Captain	end	3_127	Approach contact Tower at NETEE on 124.15"
						OP_listen_to "NASA 227 descend and maintain 1800'. Cleared for the RNAV 18R
1	33.2	approach_initial	First_Officer	end	3_373	Approach contact Tower at NETEE on 124.15"
						OP_say_message "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	35.6	approach_initial	First_Officer	end	3_10	Approach contact Tower at NETEE 124.15 NASA 227"
						Listen to "Roger descend and maintain 1800'. Cleared for the RNAV 18R
1	35.6	approach_initial	Captain	end	3_325	Approach contact Tower at NETEE 124.15 NASA 227"
1	35.6	approach_initial	First_Officer	start	3_584	altitude knob
1	36	approach_initial	First_Officer	end	3_584	altitude knob
1	36	approach_initial	First_Officer	start	3_585	Set altitude to 1800'
1	38	approach_initial	First_Officer	end	3_585	Set altitude to 1800'
1	38	approach_initial	First_Officer	start	3_586	return hand
1	38.2	approach_initial	First_Officer	end	3_586	return hand
1	38.2	approach_initial	Captain	start	3_589	Confirm Altitude 1800.
1	38.2	approach_initial	First_Officer	start	3_636	Listen to "Confirm Altitude 1800."
1	39.3	approach_initial	First_Officer	end	3_636	Listen to "Confirm Altitude 1800."
1	40.2	approach_initial	Captain	start	3_350	Reach speed dial
1	40.2	approach_initial	Captain	end	3_589	Confirm Altitude 1800.
1	40.7	approach_initial	Captain	end	3_350	Reach speed dial
1	40.7	approach_initial	Captain	start	3_809	Set Target Speed
1	45.7	approach_initial	Captain	start	3_375	return hand
1	45.7	approach_initial	Captain	end	3_809	Set Target Speed
1	46	approach_initial	First_Officer	start	3_603	Crosscheck Speed 180
1	46	approach_initial	First_Officer	start	3_641	Listen to "Set speed 180."
1	46	approach_initial	Captain	start	3_646	Listen to "Crosscheck speed 180"
1	46.2	approach_initial	Captain	end	3_375	return hand
1	46.6	approach_initial	First_Officer	end	3_641	Listen to "Set speed 180."
1	46.9	approach_initial	Captain	end	3_646	Listen to "Crosscheck speed 180"
1	47.9	approach_initial	First_Officer	end	3_603	Crosscheck Speed 180
1	51.2	approach_initial	Captain	start	3_351	Flaps One

1	51.2	approach_initial	First_Officer	start	3_598	OP_listen_to Flaps 1 Command
1	51.6	approach_initial	Captain	end	3_351	Flaps One
1	51.6	approach_initial	First_Officer	end	3_598	OP_listen_to Flaps 1 Command
1	56.3	approach_initial	First_Officer	start	3_590	Reach for Flaps
1	56.7	approach_initial	First_Officer	end	3_590	Reach for Flaps
1	56.7	approach_initial	First_Officer	start	3_592	Say "Flaps 1"
1	56.7	approach_initial	First_Officer	start	3_596	return hand
1	56.7	approach_initial	First_Officer	start	3_597	Set Flaps Level on EICAS to "One"
1	56.7	approach_initial	First_Officer	end	3_597	Set Flaps Level on EICAS to "One"
1	56.7	approach_initial	Captain	start	3_649	Listen to "Flaps 1"
1	56.7	approach_initial	First_Officer	start	3_802	Set Flaps
1	56.7	approach_initial	First_Officer	end	3_802	Set Flaps
1	56.9	approach_initial	First_Officer	end	3_596	return hand
1	57.1	approach_initial	Captain	start	3_601	Confirm Flaps "One"
1	57.1	approach_initial	Captain	end	3_649	Listen to "Flaps 1"
1	57.1	approach_initial	First_Officer	start	3_676	Listen to "Confirm Flaps 1"
1	57.2	approach_initial	First_Officer	end	3_592	Say "Flaps 1"
1	58	approach_initial	First_Officer	end	3_676	Listen to "Confirm Flaps 1"
1	59.1	approach_initial	Captain	end	3_601	Confirm Flaps "One"
1	59.1	approach_initial	Captain	start	3_691	Say "Flaps Five"
1	59.6	approach_initial	Captain	end	3_691	Say "Flaps Five"
1	64.2	approach_initial	First_Officer	start	3_692	Reach for Flaps
1	64.2	approach_initial	First_Officer	start	3_700	OP_listen_to Flaps Five Command
1	64.6	approach_initial	First_Officer	end	3_692	Reach for Flaps
1	64.6	approach_initial	First_Officer	start	3_694	Say "Flaps Five"
1	64.6	approach_initial	First_Officer	start	3_698	return hand
1	64.6	approach_initial	First_Officer	start	3_699	Set Flaps Level on EICAS to "5"
1	64.6	approach_initial	First_Officer	end	3_699	Set Flaps Level on EICAS to "5"
1	64.6	approach_initial	Captain	start	3_705	Listen to "Flaps Five"
1	64.6	approach_initial	First_Officer	start	3_803	Set Flaps
1	64.6	approach_initial	First_Officer	end	3_803	Set Flaps
1	64.7	approach_initial	First_Officer	end	3_700	OP_listen_to Flaps Five Command
1	64.8	approach_initial	First_Officer	end	3_698	return hand
1	65.1	approach_initial	First_Officer	end	3_694	Say "Flaps Five"
1	65.3	approach_initial	Captain	start	3_703	Confirm Flaps "Five"
1	65.3	approach_initial	Captain	end	3_705	Listen to "Flaps Five"
1	65.3	approach_initial	First_Officer	start	3_707	Listen to "Confirm Flaps Five"
1	65.3	approach_initial	Captain	start	3_710	Say "Flaps Fifteen"
1	66	approach_initial	First_Officer	end	3_707	Listen to "Confirm Flaps Five"

1	66	approach_initial	Captain	end	3_710	Say "Flaps Fifteen"
1	67.3	approach_initial	Captain	end	3_703	Confirm Flaps "Five"
1	70.6	approach_initial	First_Officer	start	3_711	Reach for Flaps
1	70.6	approach_initial	First_Officer	start	3_719	OP_listen_to Flaps Fifteen Command
1	70.9	approach_initial	First_Officer	end	3_711	Reach for Flaps
1	70.9	approach_initial	First_Officer	start	3_713	Say "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	start	3_717	return hand
1	70.9	approach_initial	First_Officer	start	3_718	Set Flaps Level on EICAS to "15"
1	70.9	approach_initial	First_Officer	end	3_718	Set Flaps Level on EICAS to "15"
1	70.9	approach_initial	Captain	start	3_724	Listen to "Flaps Fifteen"
1	70.9	approach_initial	First_Officer	start	3_804	Set Flaps
1	70.9	approach_initial	First_Officer	end	3_804	Set Flaps
1	71.1	approach_initial	First_Officer	end	3_717	return hand
1	71.2	approach_initial	First_Officer	end	3_719	OP_listen_to Flaps Fifteen Command
1	71.6	approach_initial	First_Officer	end	3_713	Say "Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_722	Confirm Flaps "Fifteen"
1	71.8	approach_initial	Captain	end	3_724	Listen to "Flaps Fifteen"
1	71.8	approach_initial	First_Officer	start	3_726	Listen to "Confirm Flaps Fifteen"
1	71.8	approach_initial	Captain	start	3_754	Listen to Datalink Chime
1	72.9	approach_initial	First_Officer	end	3_726	Listen to "Confirm Flaps Fifteen"
1	72.9	approach_initial	Captain	end	3_754	Listen to Datalink Chime
1	73.8	approach_initial	Captain	end	3_722	Confirm Flaps "Fifteen"
1	77.1	approach_initial	First_Officer	start	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	end	3_755	Listen to Datalink Chime
1	78.3	approach_initial	First_Officer	start	3_759	Reach for Lower EICAS
1	78.7	approach_initial	First_Officer	end	3_759	Reach for Lower EICAS
1	78.7	approach_initial	First_Officer	start	3_760	Push button on Lower EICAS to open message
1	79.4	approach_initial	First_Officer	end	3_760	Push button on Lower EICAS to open message
1	79.4	approach_initial	First_Officer	start	3_761	Return hand to Notepad
1	79.6	approach_initial	First_Officer	end	3_761	Return hand to Notepad
1	79.6	approach_initial	First_Officer	start	3_763	Reading Datalink Message
1	79.6	approach_initial	First_Officer	start	3_764	Verbalizing Datalink Message aloud to Captain
1	79.6	approach_initial	Captain	start	3_771	Listen to "Datalink message to read"
1	80.8	approach_initial	First_Officer	end	3_764	Verbalizing Datalink Message aloud to Captain
1	80.8	approach_initial	Captain	end	3_771	Listen to "Datalink message to read"
1	81.1	approach_initial	First_Officer	end	3_763	Reading Datalink Message
1	84.9	approach_initial	Captain	start	3_767	Captain tells FO to "Accept Datalink Message"
1	84.9	approach_initial	First_Officer	start	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	end	3_767	Captain tells FO to "Accept Datalink Message"

1	86	approach_initial	First_Officer	end	3_774	Listen to "Accept Datalink Message"
1	86	approach_initial	Captain	start	3_781	Reach for Lower EICAS
1	86.4	approach_initial	Captain	end	3_781	Reach for Lower EICAS
1	86.4	approach_initial	Captain	start	3_782	Push button on Lower MCP to engate separation automation
1	87.1	approach_initial	Captain	end	3_782	Push button on Lower MCP to engate separation automation
1	87.1	approach_initial	Captain	start	3_783	Return hand to Notepad
1	87.3	approach_initial	Captain	end	3_783	Return hand to Notepad
1	90.2	approach_initial	First_Officer	start	3_776	Reach for Lower EICAS
1	90.5	approach_initial	First_Officer	end	3_776	Reach for Lower EICAS
1	90.5	approach_initial	First_Officer	start	3_777	Push button on Lower EICAS to accept message
1	91.2	approach_initial	First_Officer	end	3_777	Push button on Lower EICAS to accept message
1	91.2	approach_initial	First_Officer	start	3_778	Return hand to Notepad
1	91.4	approach_initial	First_Officer	end	3_778	Return hand to Notepad
1	94.7	approach_initial	Captain	start	3_59	Call for Flaps 20
1	95.1	approach_initial	Captain	end	3_59	Call for Flaps 20
1	99	approach_initial	First_Officer	start	3_469	OP_listen_to flaps command
1	99.4	approach_initial	First_Officer	end	3_469	OP_listen_to flaps command
1	99.9	approach_initial	First_Officer	start	3_60	Reach for Flaps
1	100.3	approach_initial	First_Officer	start	3_205	return hand
1	100.3	approach_initial	First_Officer	start	3_303	Set Flaps Level on EICAS
1	100.3	approach_initial	First_Officer	end	3_303	Set Flaps Level on EICAS
1	100.3	approach_initial	Captain	start	3_468	OP_listen_to "Flaps 20"
1	100.3	approach_initial	First_Officer	end	3_60	Reach for Flaps
1	100.3	approach_initial	First_Officer	start	3_62	Say "Flaps 20"
1	100.3	approach_initial	First_Officer	start	3_805	Set Flaps
1	100.3	approach_initial	First_Officer	end	3_805	Set Flaps
1	100.5	approach_initial	First_Officer	end	3_205	return hand
1	100.7	approach_initial	First_Officer	end	3_62	Say "Flaps 20"
1	100.9	approach_initial	Captain	end	3_468	OP_listen_to "Flaps 20"
1	105.4	approach_initial	Captain	start	3_680	Confirm Flaps 20
1	105.4	approach_initial	First_Officer	start	3_683	Listen to "Confirm Flaps 20"
1	106.2	approach_initial	First_Officer	end	3_683	Listen to "Confirm Flaps 20"
1	107.4	approach_initial	Captain	start	3_242	RH throttle
1	107.4	approach_initial	Captain	start	3_46	Command "Gear Down Landing Checklist
1	107.4	approach_initial	Captain	end	3_680	Confirm Flaps 20
1	107.7	approach_initial	Captain	end	3_242	RH throttle
1	108.8	approach_initial	Captain	end	3_46	Command "Gear Down Landing Checklist
1	112.8	approach_initial	First_Officer	start	3_147	Reach for Landing Gear Control
1	112.8	approach_initial	First_Officer	start	3_470	OP_listen_to "Gear Down Landing Checklist

1	113.2	approach_initial	First_Officer	end	3_147	Reach for Landing Gear Control
1	113.2	approach_initial	First_Officer	start	3_207	return hand
1	113.2	approach_initial	First_Officer	start	3_808	Set Gear
1	113.2	approach_initial	First_Officer	end	3_808	Set Gear
1	113.5	approach_initial	First_Officer	end	3_207	return hand
1	113.5	approach_initial	First_Officer	start	3_548	Display Select Panel
1	113.5	approach_initial	First_Officer	start	3_560	Landing Checklist
1	113.5	approach_initial	First_Officer	end	3_560	Landing Checklist
1	113.8	approach_initial	First_Officer	end	3_548	Display Select Panel
1	113.8	approach_initial	First_Officer	start	3_549	Display Select Panel
1	114.2	approach_initial	First_Officer	end	3_470	OP_listen_to "Gear Down Landing Checklist
1	114.5	approach_initial	First_Officer	end	3_549	Display Select Panel
1	114.5	approach_initial	First_Officer	start	3_555	Return LH to default spot
1	114.8	approach_initial	First_Officer	start	3_551	Check List
1	114.8	approach_initial	First_Officer	end	3_555	Return LH to default spot
1	117.1	approach_initial	First_Officer	end	3_551	Check List
1	117.1	approach_initial	First_Officer	start	3_552	Verify
1	117.4	approach_initial	First_Officer	start	3_550	Ack Notification
1	117.4	approach_initial	First_Officer	end	3_552	Verify
1	118.4	approach_initial	First_Officer	start	3_149	Ack Gear Down
1	118.4	approach_initial	Captain	start	3_467	OP_listen_to Ack of Gear Down
1	118.4	approach_initial	First_Officer	start	3_526	Update EICAS
1	118.4	approach_initial	First_Officer	end	3_526	Update EICAS
1	118.4	approach_initial	First_Officer	end	3_550	Ack Notification
1	118.4	approach_initial	First_Officer	start	3_551	Check List
1	119	approach_initial	First_Officer	end	3_149	Ack Gear Down
1	119	approach_initial	Captain	end	3_467	OP_listen_to Ack of Gear Down
1	120.7	approach_initial	First_Officer	end	3_551	Check List
1	120.7	approach_initial	First_Officer	start	3_552	Verify
1	121.2	approach_initial	First_Officer	start	3_550	Ack Notification
1	121.2	approach_initial	First_Officer	end	3_552	Verify
1	122.2	approach_initial	First_Officer	end	3_550	Ack Notification
1	122.2	approach_initial	First_Officer	start	3_551	Check List
1	123.7	approach_initial	Captain	start	3_608	Confirm gear down
1	124.5	approach_initial	First_Officer	end	3_551	Check List
1	124.5	approach_initial	First_Officer	start	3_552	Verify
1	124.7	approach_initial	First_Officer	start	3_550	Ack Notification
1	124.7	approach_initial	First_Officer	end	3_552	Verify
1	125.7	approach_initial	Captain	start	3_53	Reach speed dial

1	125.7	approach_initial	First_Officer	end	3_550	Ack Notification
1	125.7	approach_initial	Captain	end	3_608	Confirm gear down
1	126.1	approach_initial	Captain	end	3_53	Reach speed dial
1	126.1	approach_initial	Captain	start	3_810	Set Target Speed
1	131.1	approach_initial	Captain	start	3_381	get altitude to report
1	131.1	approach_initial	Captain	end	3_381	get altitude to report
1	131.1	approach_initial	Captain	start	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	end	3_509	Right MFD Heading 180 degrees for offset ILS to 18R
1	131.1	approach_initial	Captain	start	3_55	Call out Speed
1	131.1	approach_initial	First_Officer	start	3_627	Listen to "Speed is 146 knots"
1	131.1	approach_initial	Captain	end	3_810	Set Target Speed
1	132	approach_initial	Captain	end	3_55	Call out Speed
1	132	approach_initial	First_Officer	end	3_627	Listen to "Speed is 146 knots"
1	136.4	approach_initial	First_Officer	start	3_610	Confirm Speed 146
1	136.4	approach_initial	Captain	start	3_655	Crosscheck speed 146
1	137.4	approach_initial	Captain	end	3_655	Crosscheck speed 146
1	138.4	approach_initial	First_Officer	end	3_610	Confirm Speed 146
1	141.7	approach_initial	Captain	start	3_248	speed brake
1	142	approach_initial	Captain	end	3_248	speed brake
1	142	approach_initial	Captain	start	3_249	arm speed brake
1	142.7	approach_initial	Captain	start	3_210	Return Hand
1	142.7	approach_initial	Captain	end	3_249	arm speed brake
1	142.7	approach_initial	Captain	start	3_511	Update EICAS
1	142.7	approach_initial	Captain	end	3_511	Update EICAS
1	143	approach_initial	Captain	end	3_210	Return Hand
1	143	approach_initial	Captain	start	3_744	LNAV and VNAV Check
1	143	approach_initial	Captain	start	3_745	Say "Checking LNAV and VNAV Mode"
1	143	approach_initial	First_Officer	start	3_748	Listen to "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	Captain	end	3_745	Say "Checking LNAV and VNAV Mode"
1	144.4	approach_initial	First_Officer	end	3_748	Listen to "Checking LNAV and VNAV Mode"
1	144.5	approach_initial	Captain	end	3_744	LNAV and VNAV Check
1	148.4	approach_transitional_1	First_Officer	start	3_750	Confirm LNAV and VNAV Modes
1	148.4	approach_transitional_1	Captain	start	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	149.8	approach_transitional_1	Captain	start	3_253	Command Flaps 25
1	149.8	approach_transitional_1	Captain	end	3_753	Listen to "Confirming LNAV and VNAV Mode"
1	150.2	approach_transitional_1	Captain	end	3_253	Command Flaps 25
1	150.4	approach_transitional_1	First_Officer	start	3_656	Listen to Flaps 25
1	150.4	approach_transitional_1	First_Officer	end	3_750	Confirm LNAV and VNAV Modes
1	150.8	approach_transitional_1	First_Officer	end	3_656	Listen to Flaps 25

1	155.2	approach_transitional_1	First_Officer	start	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	start	3_231	FO acknowledges "Flaps 25"
1	155.5	approach_transitional_1	First_Officer	start	3_258	Return LH to default spot
1	155.5	approach_transitional_1	First_Officer	end	3_259	Flaps Control
1	155.5	approach_transitional_1	First_Officer	start	3_527	Set Flaps Level on Upper EICAS
1	155.5	approach_transitional_1	First_Officer	end	3_527	Set Flaps Level on Upper EICAS
1	155.5	approach_transitional_1	Captain	start	3_653	Listen to "Flaps 25"
1	155.5	approach_transitional_1	First_Officer	start	3_807	Set Flaps
1	155.5	approach_transitional_1	First_Officer	end	3_807	Set Flaps
1	155.7	approach_transitional_1	First_Officer	end	3_258	Return LH to default spot
1	155.9	approach_transitional_1	First_Officer	end	3_231	FO acknowledges "Flaps 25"
1	156.1	approach_transitional_1	Captain	end	3_653	Listen to "Flaps 25"
1	160.6	approach_transitional_1	Captain	start	3_658	Crosscheck Flaps 25
1	160.6	approach_transitional_1	First_Officer	start	3_667	Listen to Crosscheck
1	160.6	approach_transitional_1	Captain	start	3_669	Crosscheck flaps 25
1	160.6	approach_transitional_1	Captain	end	3_669	Crosscheck flaps 25
1	161.6	approach_transitional_1	First_Officer	end	3_667	Listen to Crosscheck
1	162.6	approach_transitional_1	Captain	end	3_658	Crosscheck Flaps 25
1	167.7	approach_transitional_1	First_Officer	start	3_269	Flaps Control
1	167.7	approach_transitional_1	First_Officer	start	3_660	Flaps 30
1	168.1	approach_transitional_1	First_Officer	start	3_266	Say "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_268	Return LH to default spot
1	168.1	approach_transitional_1	First_Officer	end	3_269	Flaps Control
1	168.1	approach_transitional_1	First_Officer	start	3_528	Set Flaps Level on Upper EICAS
1	168.1	approach_transitional_1	First_Officer	end	3_528	Set Flaps Level on Upper EICAS
1	168.1	approach_transitional_1	First_Officer	end	3_660	Flaps 30
1	168.1	approach_transitional_1	Captain	start	3_665	Listen to "Flaps 30"
1	168.1	approach_transitional_1	First_Officer	start	3_806	Set Flaps
1	168.1	approach_transitional_1	First_Officer	end	3_806	Set Flaps
1	168.3	approach_transitional_1	First_Officer	end	3_268	Return LH to default spot
1	168.5	approach_transitional_1	First_Officer	end	3_266	Say "Flaps 30"
1	168.7	approach_transitional_1	Captain	end	3_665	Listen to "Flaps 30"
1	173.2	approach_transitional_1	Captain	start	3_666	Crosscheck Flaps 30
1	173.2	approach_transitional_1	Captain	start	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	Captain	end	3_671	Crosscheck flaps 30
1	173.2	approach_transitional_1	First_Officer	start	3_672	Listen to Crosscheck
1	174.1	approach_transitional_1	First_Officer	end	3_672	Listen to Crosscheck
1	175.2	approach_transitional_1	Captain	end	3_666	Crosscheck Flaps 30
1	178.3	approach_transitional_1	Captain	start	3_563	Listen to "Landing Checklist complete"

1	178.3	approach_transitional_1	First_Officer	start	3_686	Landing Checklist complete
1	179.6	approach_transitional_1	First_Officer	start	3_273	radio freq control
1	179.6	approach_transitional_1	Captain	start	3_562	Confirm Roger Landing Checklist complete
1	179.6	approach_transitional_1	Captain	end	3_563	Listen to "Landing Checklist complete"
1	179.6	approach_transitional_1	First_Officer	end	3_686	Landing Checklist complete
1	180	approach_transitional_1	First_Officer	start	3_271	radio freq control
1	180	approach_transitional_1	First_Officer	end	3_273	radio freq control
1	180.7	approach_transitional_1	First_Officer	end	3_271	radio freq control
1	180.7	approach_transitional_1	First_Officer	start	3_272	Return hand
1	180.9	approach_transitional_1	First_Officer	end	3_272	Return hand
1	180.9	approach_transitional_1	First_Officer	start	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	181.2	approach_transitional_1	Captain	end	3_562	Confirm Roger Landing Checklist complete
1	182.7	approach_transitional_1	First_Officer	end	3_279	OP_say_message "Tower NASA 227 for one-eight-right"
1	182.7	approach_transitional_1	First_Officer	start	3_280	Listen to
1	182.7	approach_transitional_1	Captain	start	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	182.7	default	ATC_Controller	start	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	184	approach_transitional_1	Captain	end	3_465	OP_listen_to "NASA 227 cleared to land on one-eight-right"
1	184.8	approach_transitional_1	First_Officer	end	3_280	Listen to
1	184.8	approach_transitional_1	First_Officer	start	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	184.8	default	ATC_Controller	end	39_38	Say "NASA 227 cleared to land on one-eight-right."
1	184.8	default	ATC_Controller	start	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	185.1	default	ATC_Controller	end	39_58	Calculate distance between ownship and intersection of 18R and E6.
1	187.4	approach_transitional_1	First_Officer	end	3_281	FO replies "Roger cleared to land one-eight-right for NASA 227"
1	204.8	approach_transitional_2	First_Officer	start	3_85	Call out 1000 feet - Instruments Cross Checked
1	204.8	approach_transitional_2	First_Officer	start	3_91	PFD
1	204.8	approach_transitional_2	First_Officer	end	3_91	PFD
1	206.7	approach_transitional_2	First_Officer	end	3_85	Call out 1000 feet - Instruments Cross Checked
1	238.7	land_initial	Captain	start	100_421	Count 2 displays to comprehend
1	238.7	land_initial	Captain	end	100_421	Count 2 displays to comprehend
1	238.7	land_initial	First_Officer	start	100_431	Count 2 displays to comprehend
1	238.7	land_initial	First_Officer	end	100_431	Count 2 displays to comprehend
1	238.7	land_initial	Captain	start	100_443	Assign Entities the Color "Yellow"
1	238.7	land_initial	Captain	end	100_443	Assign Entities the Color "Yellow"
1	238.7	land_initial	First_Officer	start	100_444	Assign Entities the Color "Yellow"
1	238.7	land_initial	First_Officer	end	100_444	Assign Entities the Color "Yellow"
1	238.7	land_initial	Captain	start	100_70	Show CA Yellow Aircraft Blunder Display
1	238.7	land_initial	Captain	end	100_70	Show CA Yellow Aircraft Blunder Display
1	238.7	land_initial	First_Officer	start	100_84	Show FO Yellow Aircraft Blunder Display
1	238.7	land_initial	First_Officer	end	100_84	Show FO Yellow Aircraft Blunder Display

1	239.4	land_initial	Captain	start	100_100	Listen To "CA Yellow Blunder Alert" from FO
1	239.4	land_initial	First_Officer	start	100_454	Say to CA "CA Yellow Blunder Alert
1	239.4	land_initial	First_Officer	start	100_455	FO advises CA of seeing Yellow Blunder
1	239.4	land_initial	First_Officer	end	100_455	FO advises CA of seeing Yellow Blunder
1	239.4	land_initial	First_Officer	start	100_456	FO_Sees_Yellow
1	239.4	land_initial	First_Officer	end	100_456	FO_Sees_Yellow
1	239.4	land_initial	First_Officer	start	100_457	Do not release if CA sees yellow first
1	239.4	land_initial	First_Officer	end	100_457	Do not release if CA sees yellow first
1	240.6	land_initial	Captain	end	100_100	Listen To "CA Yellow Blunder Alert" from FO
1	240.6	land_initial	First_Officer	end	100_454	Say to CA "CA Yellow Blunder Alert
1	240.9	land_initial	Captain	start	100_451	CA_Sees_Yellow
1	240.9	land_initial	Captain	end	100_451	CA_Sees_Yellow
1	240.9	land_initial	Captain	start	100_589	Release if FO sees yellow first
1	240.9	land_initial	Captain	end	100_589	Release if FO sees yellow first
1	240.9	land_initial	Captain	start	100_592	Listen To "CA Yellow Blunder Alert" from FO
1	240.9	land_initial	First_Officer	start	100_593	Release if CA sees yellow first
1	240.9	land_initial	First_Officer	end	100_593	Release if CA sees yellow first
1	241.8	land_initial	Captain	start	52_238	OP_listen_to FO to say "500 feet"
1	241.8	land_initial	First_Officer	start	52_249	OP_listen_to headset 500 feet
1	242.1	land_initial	Captain	end	100_592	Listen To "CA Yellow Blunder Alert" from FO
1	242.2	land_initial	Captain	end	52_238	OP_listen_to FO to say "500 feet"
1	242.2	land_initial	First_Officer	end	52_249	OP_listen_to headset 500 feet
1	242.6	land_initial	Captain	start	100_424	Count 2 displays to comprehend
1	242.6	land_initial	Captain	end	100_424	Count 2 displays to comprehend
1	242.6	land_initial	Captain	start	100_445	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.6	land_initial	Captain	end	100_445	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.6	land_initial	First_Officer	start	100_446	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.6	land_initial	First_Officer	end	100_446	Assign Entities the Color "Red" Stop all Yellow Entities
1	242.6	land_initial	Captain	start	100_489	MAP Comm within the past 5 seconds?
1	242.6	land_initial	Captain	end	100_489	MAP Comm within the past 5 seconds?
1	242.6	land_initial	First_Officer	start	100_556	Count 2 displays to comprehend
1	242.6	land_initial	First_Officer	end	100_556	Count 2 displays to comprehend
1	242.6	land_initial	First_Officer	start	100_557	MAP Comm within the past 5 seconds?
1	242.6	land_initial	First_Officer	end	100_557	MAP Comm within the past 5 seconds?
1	242.6	land_initial	Captain	start	100_71	Show CA Red Aircraft Blunder Display
1	242.6	land_initial	Captain	end	100_71	Show CA Red Aircraft Blunder Display
1	242.6	land_initial	Captain	start	100_77	Listen To
1	242.6	land_initial	Captain	end	100_77	Listen To
1	242.6	land_initial	First_Officer	start	100_78	Listen To

1	242.6	land_initial	First_Officer	end	100_78	Listen To
1	242.6	land_initial	First_Officer	start	100_86	Show FO Red Aircraft Blunder Display
1	242.6	land_initial	First_Officer	end	100_86	Show FO Red Aircraft Blunder Display
1	242.7	land_initial	First_Officer	start	100_480	Say to CA "Red Blunder Alert
1	242.7	land_initial	First_Officer	start	100_481	FO advises CA of seeing Red Blunder
1	242.7	land_initial	First_Officer	end	100_481	FO advises CA of seeing Red Blunder
1	242.7	land_initial	First_Officer	start	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	242.7	land_initial	First_Officer	end	100_482	FO_Sees_Red Stop all "aqua" entities in regular procedures
1	242.7	land_initial	First_Officer	start	100_483	Do not release if CA sees red first
1	242.7	land_initial	First_Officer	end	100_483	Do not release if CA sees red first
1	242.7	land_initial	Captain	start	100_581	Listen To "CA Red Blunder Alert" from FO
1	243.7	land_initial	First_Officer	end	100_480	Say to CA "Red Blunder Alert
1	243.7	land_initial	Captain	end	100_581	Listen To "CA Red Blunder Alert" from FO
1	244	land_initial	Captain	start	100_477	CA_Sees_Red Stop all "aqua" entities in regular procedures
1	244	land_initial	Captain	end	100_477	CA_Sees_Red Stop all "aqua" entities in regular procedures
1	244	land_initial	Captain	start	100_585	Release if FO sees red first
1	244	land_initial	Captain	end	100_585	Release if FO sees red first
1	244	land_initial	Captain	start	100_588	Listen To "CA Red Blunder Alert" from FO
1	244	land_initial	First_Officer	start	100_597	Release if CA sees red first
1	244	land_initial	First_Officer	end	100_597	Release if CA sees red first
1	245	land_initial	Captain	end	100_588	Listen To "CA Red Blunder Alert" from FO
1	250.6	land_initial	Captain	start	100_33	Press TOGA Button on Thrust Lever
1	250.6	land_initial	Captain	start	100_425	Red Blunder Visible
1	250.6	land_initial	Captain	end	100_425	Red Blunder Visible
1	250.6	land_initial	Captain	start	100_45	Press TOGA button if alert is visible
1	250.6	land_initial	Captain	end	100_45	Press TOGA button if alert is visible
1	250.6	land_initial	Captain	start	100_458	Confirm that ND and OTW match (Spatial Compare)
1	250.6	land_initial	Captain	start	100_51	Ensure Single Press of TOGA Button
1	250.6	land_initial	Captain	end	100_51	Ensure Single Press of TOGA Button
1	251.3	land_initial	Captain	end	100_33	Press TOGA Button on Thrust Lever
1	253.1	land_initial	First_Officer	start	100_438	Red Blunder Visible
1	253.1	land_initial	First_Officer	end	100_438	Red Blunder Visible
1	253.1	land_initial	First_Officer	start	100_465	Confirm that ND and OTW match (Spatial Compare)
1	253.5	breakaway	Captain	end	100_458	Confirm that ND and OTW match (Spatial Compare)
1	253.5	breakaway	Captain	start	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	253.5	breakaway	Captain	start	100_461	CA: "Prepare for standard missed approach procedure..."
1	253.5	breakaway	Captain	end	100_461	CA: "Prepare for standard missed approach procedure..."
1	256.1	land_initial	First_Officer	end	100_465	Confirm that ND and OTW match (Spatial Compare)

1	256.1	land_initial	First_Officer	start	100_470	Listen To ""Prepare for standard missed approach procedure climb to MAP."
1	256.7	breakaway	Captain	end	100_460	Say to FO "Prepare for standard missed approach procedure climb to MAP."
1	259.3	land_initial	First_Officer	start	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	259.3	land_initial	First_Officer	end	100_470	Listen To ""Prepare for standard missed approach procedure climb to MAP."
1	259.3	breakaway	Captain	start	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	262.1	land_initial	First_Officer	end	100_435	Say to CA "Roger prepare for standard missed approach procedure."
1	262.1	breakaway	Captain	end	100_473	Listen To "Roger prepare for standard missed approach procedure."
1	262.1	breakaway	Captain	start	100_485	Declare Time of MAP Comms Finished Reset variables
1	262.1	breakaway	Captain	end	100_485	Declare Time of MAP Comms Finished Reset variables
1	262.1	land_initial	First_Officer	start	100_557	MAP Comm within the past 5 seconds?
1	262.1	land_initial	First_Officer	end	100_557	MAP Comm within the past 5 seconds?
1	262.1	land_initial	First_Officer	start	100_558	FO stands by while Captain presses the TOGA button
1	262.1	land_initial	First_Officer	end	100_558	FO stands by while Captain presses the TOGA button
1	262.1	land_initial	First_Officer	start	100_608	Route for red or yellow status
1	262.1	land_initial	First_Officer	end	100_608	Route for red or yellow status
1	271.3	default	ATC_Controller	start	101_24	NASA 227 Contact Regional Approach on 118.42.
1	271.3	default	ATC_Controller	start	101_63	ATC Tasks
1	271.3	default	ATC_Controller	end	101_63	ATC Tasks
1	271.3	default	ATC_Controller	start	101_73	Assign entities the color "aqua"
1	271.3	default	ATC_Controller	end	101_73	Assign entities the color "aqua"
1	271.3	default	ATC_Controller	start	101_79_130	Test Delay

The procedural and task differences among the four scenarios are illustrated in a summary of the tasks that do not happen in each scenario. A summary of the reverse engineer task differences can be located below.

RNAV NP

Tasks that do not happen

Left MFD in landing state (ND)
Bypass Descent Option
XYZ 633 detected
Track Lead AC by Captain or FO
Scenario Specific Settings
PFD
Manual or Autoland?
Acquire Lead AC
Captain Only Acquires Runway Once, FO never does
Set IMCstate to false
Return left hand to notepad
Change autopilot button state

RNAV WP

Tasks that do not happen

Left MFD in landing state (ND)
Bypass Descent Option
Scenario Specific Settings
PFD
Manual or Autoland?
Acquire Lead AC
Captain Only Acquires Runway Once, FO never does
Set IMCstate to false
Return left hand to notepad
Change autopilot button state

VCSPA 200

Tasks that do not happen

FLCH on MCP
Maintain Runway Alignment by Captain or FO
Turn off autopilot
Autopilot alarm sounds
Silence alarm
Spatial comparison of Runway by OS
Trim and then Steer
Throttle
Apply rudder
Track lead AC happens only once by Captain in land_final context
Captain only acquires lead AC once in land_final context
Captain and FO only acquire runway in land_final context
Return left hand to notepad
Change autopilot button state

VCSPA 800

Tasks that do not happen

left MFD in landing state (ND)
Bypass Descent Option
FO only Maintains Runway Alignment
Captain does not track lead AC in land_final context
Scenario Specific Settings
PFD
Manual or Autoland?
Captain does not acquire lead AC in land_final context
Captain and FO do not acquire runway in land_final context
FO doesn’t ever track lead AC

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