Analysis Topic: ***Runway Overrun at Sao Paulo-Congonhas, 2007-07-17***

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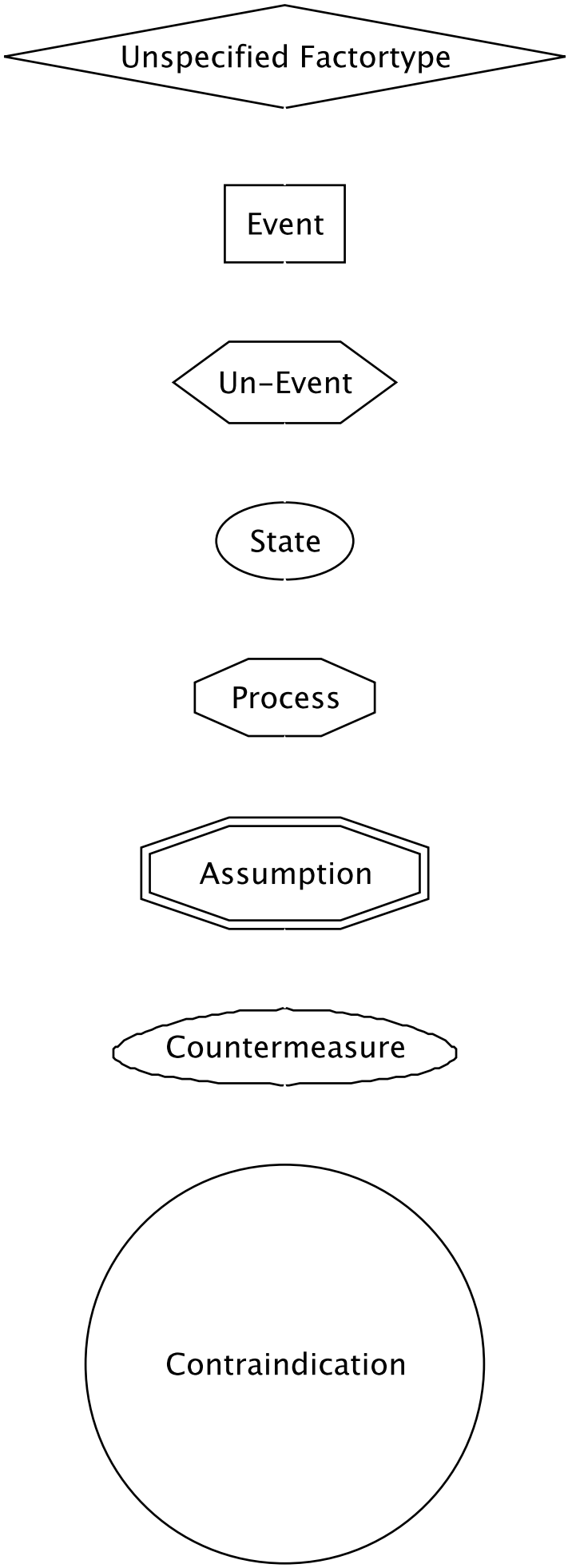
INCIDENT ANALYSIS

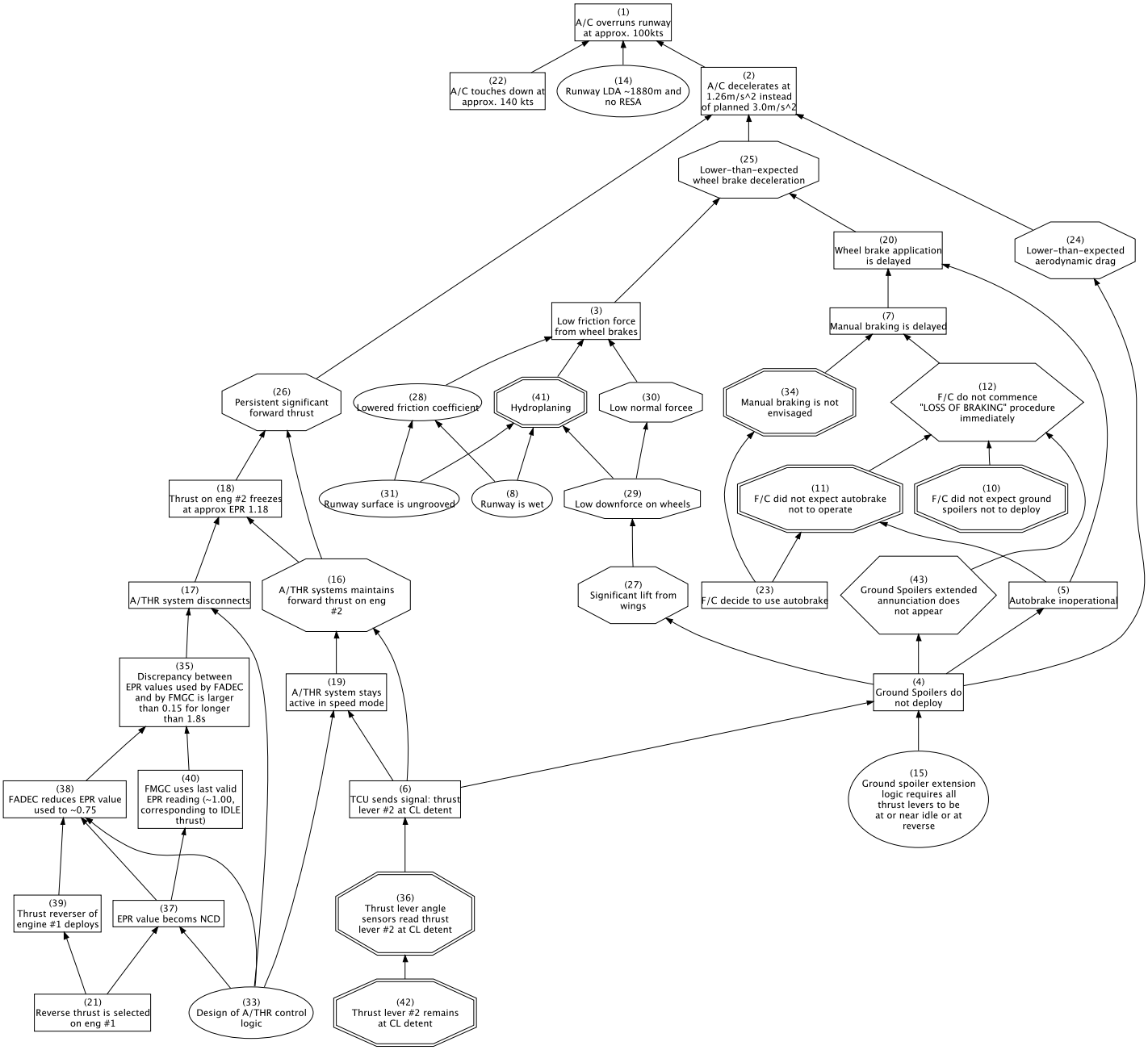
Incident description:

An Airbus A320 operated by TAM Linhas Aereas overran the runway ot CGH

Legend of Factorshapes



Why-Because Graph



Timeline of Events

Factor List - Overview

1 A/C overruns runway at approx. 100kts
2 A/C decelerates at 1.26m/s^2 instead of planned 3.0m/s^2
3 Low friction force from wheel brakes
4 Ground Spoilers do not deploy
5 Autobrake inoperational
6 TCU sends signal: thrust lever #2 at CL detent
7 Manual braking is delayed
8 Runway is wet
10 F/C did not expect ground spoilers not to deploy
11 F/C did not expect autobrake not to operate
12 F/C do not commence "LOSS OF BRAKING" procedure immediately
14 Runway LDA ~1880m and no RESA
15 Ground spoiler extension logic requires all thrust levers to be at or near idle or at reverse
16 A/THR systems maintains forward thrust on eng #2
17 A/THR system disconnects
18 Thrust on eng #2 freezes at approx EPR 1.18
19 A/THR system stays active in speed mode
20 Wheel brake application is delayed
21 Reverse thrust is selected on eng #1
22 A/C touches down at approx. 140 kts
23 F/C decide to use autobrake
24 Lower-than-expected aerodynamic drag
25 Lower-than-expected wheel brake deceleration
26 Persistent significant forward thrust
27 Significant lift from wings
28 Lowered friction coefficient
29 Low downforce on wheels
30 Low normal forcee
31 Runway surface is ungrooved
33 Design of A/THR control logic
34 Manual braking is not envisaged
35 Discrepancy between EPR values used by FADEC and by FMGC is larger than 0.15 for longer than 1.8s
36 Thrust lever angle sensors read thrust lever #2 at CL detent
37 EPR value becoms NCD
38 FADEC reduces EPR value used to ~0.75
39 Thrust reverser of engine #1 deploys
40 FMGC uses last valid EPR reading (~1.00, corresponding to IDLE thrust)
41 Hydroplaning
42 Thrust lever #2 remains at CL detent
43 Ground Spoilers extended annunciation does not appear

Factor List - Details

1 A/C overruns runway at approx. 100kts
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

2 A/C decelerates at 1.26m/s^2 instead of planned 3.0m/s^2
Type of Factor: Event
Date/Time:
Actors involved:
Annotation: Autobrake MED was selected, which sets a target deceleration of 3.0m/s^2

3 Low friction force from wheel brakes
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

4 Ground Spoilers do not deploy
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

5 Autobrake inoperational
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

6 TCU sends signal: thrust lever #2 at CL detent
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

7 Manual braking is delayed
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

8 Runway is wet
Type of Factor: State
Date/Time:
Actors involved:
Annotation: This autothrust disconnect mechanism is described in the Incident report of the Taipei-Sungshan-Overrun. It is assumed to be similar in this incident, pending confirmation from AI.

10 F/C did not expect ground spoilers not to deploy
Type of Factor: Assumption
Date/Time:
Actors involved:
Annotation:

11 F/C did not expect autobrake not to operate
Type of Factor: Assumption
Date/Time:
Actors involved:
Annotation:

12 F/C do not commence "LOSS OF BRAKING" procedure immediately

Type of Factor: UnEvent

Date/Time:

Actors involved:

Annotation: "LOSS of BRAKING" is a so-called "memory item", and must be applied without delay, and without referring to paper.

14 Runway LDA ~1880m and no RESA

Type of Factor: State

Date/Time:

Actors involved:

Annotation:

15 Ground spoiler extension logic requires all thrust levers to be at or near idle or at reverse

Type of Factor: State

Date/Time:

Actors involved:

Annotation:

16 A/THR systems maintains forward thrust on eng #2

Type of Factor: Process

Date/Time:

Actors involved:

Annotation: Autothrust tries to maintain approach speed ("VAPP")

17 A/THR system disconnects

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

18 Thrust on eng #2 freezes at approx EPR 1.18

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

19 A/THR system stays active in speed mode

Type of Factor: Event

Date/Time:

Actors involved:

Annotation: Since not both thrust levers were set to IDLE, autothrust remains active.

20 Wheel brake application is delayed

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

21 Reverse thrust is selected on eng #1

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

22 A/C touches down at approx. 140 kts

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

23 F/C decide to use autobrake
Type of Factor: Event
Date/Time:
Actors involved:
Annotation:

24 Lower-than-expected aerodynamic drag
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

25 Lower-than-expected wheel brake deceleration
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

26 Persistent significant forward thrust
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

27 Significant lift from wings
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

28 Lowered friction coefficient
Type of Factor: State
Date/Time:
Actors involved:
Annotation:

29 Low downforce on wheels
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

30 Low normal forcee
Type of Factor: Process
Date/Time:
Actors involved:
Annotation:

31 Runway surface is ungrooved
Type of Factor: State
Date/Time:
Actors involved:
Annotation:

33 Design of A/THR control logic
Type of Factor: State
Date/Time:
Actors involved:
Annotation:

34 Manual braking is not envisaged
Type of Factor: Assumption
Date/Time:
Actors involved:
Annotation:

35 Discrepancy between EPR values used by FADEC and by FMGC is larger than 0.15 for longer than 1.8s

Type of Factor: Event

Date/Time:

Actors involved:

Annotation: This autothrust disconnect mechanism is described in the Incident report of the Taipei-Sungshan-Overrun. It is assumed to be similar in this incident, pending confirmation from AI.

36 Thrust lever angle sensors read thrust lever #2 at CL detent

Type of Factor: Assumption

Date/Time:

Actors involved:

Annotation:

37 EPR value becoms NCD

Type of Factor: Event

Date/Time:

Actors involved:

Annotation: NCD - "No Computed Data"

This autothrust disconnect mechanism is described in the Incident report of the Taipei-Sungshan-Overrun. It is assumed to be similar in this incident, pending confirmation from AI.

38 FADEC reduces EPR value used to ~0.75

Type of Factor: Event

Date/Time:

Actors involved:

Annotation: This autothrust disconnect mechanism is described in the Incident report of the Taipei-Sungshan-Overrun. It is assumed to be similar in this incident, pending confirmation from AI.

39 Thrust reverser of engine #1 deploys

Type of Factor: Event

Date/Time:

Actors involved:

Annotation:

40 FMGC uses last valid EPR reading (~1.00, corresponding to IDLE thrust)

Type of Factor: Event

Date/Time:

Actors involved:

Annotation: This autothrust disconnect mechanism is described in the Incident report of the Taipei-Sungshan-Overrun. It is assumed to be similar in this incident, pending confirmation from AI.

41 Hydroplaning

Type of Factor: Assumption

Date/Time:

Actors involved:

Annotation:

42 Thrust lever #2 remains at CL detent

Type of Factor: Assumption

Date/Time:

Actors involved:

Annotation:

43 Ground Spoilers extended annunciation does not appear

Type of Factor: UnEvent

Date/Time:

Actors involved:

Annotation:

Actor List