

# **Amazonas Mid-Air (Sep. 29, 2006)**

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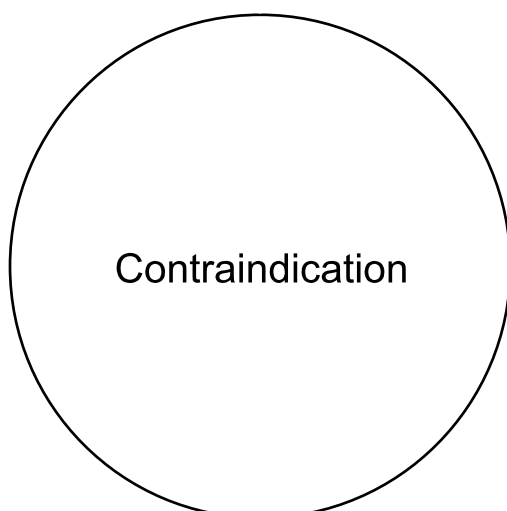
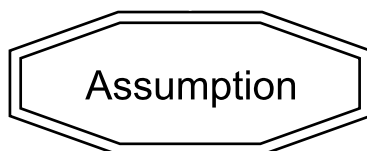
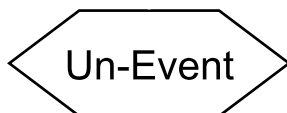
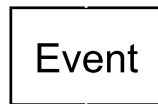
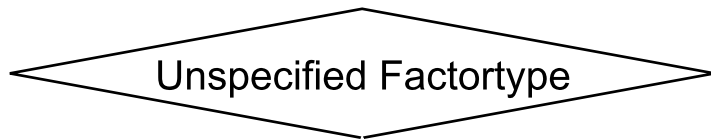
# INCIDENT ANALYSIS

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## Incident description:

Information taken from IHT Sep 30, 2006 to May 03, 2007, NYT Sep 30, 2006 to May 03, 2007, Flight International Oct 10-16, 2006 to May 08-14, 2007, Aviation Week Oct 9, 2006 to Apr. 30, 2007, NTSB Safety Recommendation May 2, 2007 and the NTSB Factual Report.

## *Legend of Factorshapes*





# Timeline of Events

		GOL Flight 1907	Embraer Legacy	Radar operator	ATC Brasilia	ATC Manaus	TCAS System	Joseph Lepore	Sao Jose dos Campos Tower
Legacy takes off from Sao Jose dos Campos with destination Manaus.	14:51:00		X						X
Legacy cleared by Tower Jose dos Campos for FL370	15:11:00							X	X
Legacy flies at FL370	15:33:00		X						
Flight 1907 from Manaus to Brasilia	15:35:00	X							
ATC Brasilia makes blind transmission ordering Legacy Crew to switch radio frequencies	15:51:00		X	X					
Legacy passes waypoint Brasilia	15:56:00		X						
Boeing B737 flies at FL370	15:58:00		X						
Legacy Transponder not broadcasting	16:02:00		X						
ATC Brasilia loses secondary radar information on Legacy			X	X					
ATC Brasilia transmits blindly to Legacy	16:26:00		X	X					
ATC Brasilia has lost primary radar contact with Legacy	16:30:00		X	X					
Legacy tracked intermittently by primary radar	16:38:00		X	X					
Legacy crew misheard frequency	16:53:00		X	X					
Legacy collides with Boeing B737	16:57:00	X	X						
Legacy transponder resumes broadcasting	17:02:00		X	X					

## ***Factor List***

- 1 Boeing B737 wreckage found
- 2 Boeing B737 crashes in Mato Grosso area
- 3 Boeing B737-800 operated by GOL
- 4 Possible Mid-Air with smaller plane
- 5 Radar contact lost during flight
- 6 Flight 1907 from Manaus to Brasilia
- 7 Legacy collides with "shadow"
- 8 Legacy loses part of a wing
- 9 Radar shows altitude difference of about 1000 feet
- 10 Boeing B737 carrying 149 passengers, 6 crew
- 11 GOL 1907 had 200 flight hours
- 12 Legacy makes emergency landing at Cachimbo air force base
- 13 Boeing B737 strikes ground at more than 300 mph
- 14 Unlikelihood of survivors
- 15 Some kind of contact between Boeing 737 and Legacy
- 16 Legacy on inaugural flight to United States
- 17 Legacy purchased by ExcelAire
- 18 Legacy takes off from Sao Jose dos Campos with destination Manaus.
- 19 Legacy briefly loses flight stability, but recovers
- 20 Legacy tail damaged
- 21 Legacy does not see Boeing B737
- 22 Legacy flies stable northwest at FL370
- 23 Legacy equipped with anticollision device
- 24 Boeing B737 equipped with anticollision device
- 25 Legacy might have flown off course
- 26 Boeing B737 might have had trouble
- 27 Boeing B737 might have lost parts
- 28 Parts of B737 might have hit Legacy
- 29 Possible lack of coordination among air traffic controllers
- 30 149 passengers and 6 crew die
- 31 Possible negligence or disregard for air-traffic instructions
- 32 Failure to detect other aircraft
- 33 Air-traffic controllers not alerted of dangerous flight path
- 34 Crew ignored instruction to descent from FL370 to FL360 passing Brasilia
- 35 Crew decided to fly higher without alerting controllers
- 36 Boeing B737 flies at FL370
- 37 Boeing B737 visible on radar until accident
- 39 Technical warning system does not operate as expected
- 40 Crew unable to find proper frequency for Manaus controllers
- 41 No radio contact between Legacy and Brasilia or Manaus until collision
- 42 TCAS on board Legacy is turned off or not working
- 43 Handover from Brasilia to Manaus required
- 44 148 passengers and 6 crew die
- 45 Controller unable to gauge altitude by radar
- 46 Single electronic failure on board of the Legacy
- 47 ATC Brasilia makes blind transmission ordering Legacy Crew to switch radio frequencies
- 48 Legacy enters jurisdiction of different ATC Center
- 49 Legacy crew misheard frequency
- 50 Crew unable to tune radio correctly
- 51 Legacy transponder resumes broadcasting
- 52 Legacy tracked intermittently by primary radar
- 53 Primary radar gives no altitude information
- 54 Controller does not warn about possible collision

55 Software requires altitude information for collision warning  
56 Legacy Transponder not broadcasting  
57 TCAS requires Transponder information for operation  
58 Boeing B737 not advised to change altitude  
59 Complete radar and radio coverage over jungle  
60 Discrepancy between Legacy flightpath, altitude and altitude assignment  
61 Legacy does not take evasive action  
62 Assumed Mid-Air Collision  
63 Both aircraft at FL370  
64 Legacy flies at FL370  
65 Both aircraft on same airway  
66 Legacy TCAS manufactured by Honeywell  
67 FAA had ordered recall on TCAS model used in Legacy  
68 TCAS device tended to stop broadcasting unexpectedly in certain circumstances  
69 Legacy Flightplan called for FL380 at point of collision  
70 Boeing B737 CVR lost in rainforest  
71 Brazilian Air Traffic System run by Brazilian Air Force  
72 Takeoff Clearance called for FL370 for the entire route  
73 ATC instruction supersedes flight plan  
74 Boeing B737 CVR found  
75 Legacy cleared by Tower Jose dos Campos for FL370  
76 Legacy collides with Boeing B737  
77 19 unsuccessful attempts to reach ATC Brasilia  
78 Boeing B737 flight plan called for FL410 at point of collision  
79 ATC Manaus instructed Boeing B737 to fly at FL370  
80 ATC believed the Legacy to fly at FL360  
81 Possible Cause for (56)  
82 Avionics component has operational problems  
83 Avionics component returned to Honeywell  
84 Honeywell returned avionics component to Embraer  
85 Embraer installed avionics component  
86 One transponder and some radio communications systems installed in avionics component  
87 Cockpit systems do not effectively alert Legacy crew of anti-collision equipment failure  
88 Boeing unable to avoid collision  
89 Boeing crew has no visual identification of conflicting traffic  
90 Legacy not advised to change altitude  
91 Boeing B737 spirals out of control  
92 Boeing B737 breaks up in mid-air  
93 Both aircraft on airway UZ6 in opposite directions  
96 Radar coverage limits at boarder between airspace sectors  
97 Notoriously unreliable radio communications in area of collision  
98 Boeing B737 in contact with Manaus  
99 Legacy technically under control of ATC Brasilia  
100 Controller Brasilia does not warn Legacy  
101 Controller Manaus did not warn Boeing B737  
102 No handover of Legacy from Brasilia to Manaus  
103 Unknown cause  
104 Legacy winglet severed Boeing B737 hydraulic and electrical lines  
105 Legacy winglet compromised Boeing B737 left wing's aileron actuators  
106 Legacy winglet deforms Boeing B737 wing  
107 Procedure to maintain current flight level "for a short time"  
108 Legacy does not change altitude  
109 Boeing B737 does not take evasive action  
110 ATC Brasilia loses secondary radar information on Legacy  
111 ATC Brasilia has lost primary radar contact with Legacy

- 112 ATC Brasilia transmits blindly to Legacy
- 113 Secondary radar information transmits altitude information
- 115 ATC monitoring system automatically updates altitude information on controller's display
- 116 Legacy passes waypoint Brasilia
- 117 System "feature": Displayed altitude set to altitude given in flight plan after passing of waypoint
- 118 Brazilian military 3-d primary radar provides flight altitude information
- 119 Military Primary radar altitude information presented to civilian controllers
- 120 Military 3-D primary radar altitude information inaccurate
- 121 Long-Range triangulation
- 122 Controller does not trust primary radar altitude information
- 123 Legacy enters UZ6
- 124 UZ6 connects Manaus and Brasilia
- 125 Boeing B737 uses UZ6
- 126 Legacy flightplan
- 127 Planned altitude change from FL370 to FL360 after passing waypoint Brasilia
- 128 Planned altitude change from FL360 to FL380 after passing TERES
- 129 Legacy crew identifies TCAS failure
- 130 TCAS unit displays "TCAS OFF" in small white letters on flight display
- 131 ATC shift change
- 132 Controller's electronic flight strip showed Legacy as assigned to FL360
- 133 Boeing B737 flightplan requested FL370 as cruise altitude
- 134 No aural warning on TCAS failure
- 135 Boeing B737 does not change altitude
- 136 Legacy maintains FL370
- 137 Placing of Legacy crew feet might have disabled Legacy communication devices

# ***Factor List - Details***

- 1 Boeing B737 wreckage found**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Reuters report, IHT Sep 30, 2006
- 2 Boeing B737 crashes in Mato Grosso area**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: evidenced by Factor 1
- 3 Boeing B737-800 operated by GOL**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Reuters report, IHT Sep 30, 2006
- 4 Possible Mid-Air with smaller plane**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: Reuters report, IHT Sep 30, 2006  
quoting local officials and media reports
- 5 Radar contact lost during flight**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Radar operator  
Annotation: Reuters report, IHT Sep 30, 2006
- 6 Flight 1907 from Manaus to Brasilia**  
Type of Factor: Process  
Date/Time: 29.09.2006 15:35:00  
Actors involved: Boeing B737-800  
Annotation: Reuters report, IHT Sep 30, 2006
- 7 Legacy collides with "shadow"**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: Statement of Defense Minister Waldir Pires on Band TV
- 8 Legacy loses part of a wing**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: Statement of Defense Minister Waldir Pires on Band TV
- 9 Radar shows altitude difference of about 1000 feet**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus  
Annotation: Reuters report, IHT Sep 30, 2006

- 10 Boeing B737 carrying 149 passengers, 6 crew**  
Type of Factor: Unspecified  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Reuters report, IHT Sep 30, 2006  
Statement by GOL
- 11 GOL 1907 had 200 flight hours**  
Type of Factor: Unspecified  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Reuters report, IHT Sep 30, 2006
- 12 Legacy makes emergency landing at Cachimbo air force base**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: Reuters report, IHT Sep 30 2006  
Statement of Defense Minister Waldr Pires on Band TV
- 13 Boeing B737 strikes ground at more than 300 mph**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: AP report, IHT Oct 1, 2006  
quoting Jose Carlos Pereira, president of Brazil's airport authority
- 14 Unlikelihood of survivors**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: AP report, IHT Oct 1, 2006  
quoting Jose Carlos Pereira, president of Brazil's airport authority
- 15 Some kind of contact between Boeing 737 and Legacy**  
Type of Factor: Unspecified  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: AP report, IHT Oct 1, 2006  
quoting Jose Carlos Pereira, president of Brazil's airport authority
- 16 Legacy on inaugural flight to United States**  
Type of Factor: Unspecified  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: AP report, IHT Oct 1, 2006
- 17 Legacy purchased by ExcelAire**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: AP report, IHT Oct 1, 2006  
quoting Embraer and Milton Zuanazzi, general director for Brazil's Civil Aviation Agency  
Authority
- 18 Legacy takes off from Sao Jose dos Campos with destination Manaus.**  
Type of Factor: Process  
Date/Time: 29.09.2006 14:51:00  
Actors involved: Embraer Legacy  
Air Traffic Control at Sao Jose dos Campos Airport, Brazil  
Annotation: AP report, IHT Oct 1, 2006  
quoting Diane McNulty, New York Times spokeswoman

**19 Legacy briefly loses flight stability, but recovers**

Type of Factor: Process

Date/Time:

Actors involved: Embraer Legacy

Annotation: AP report, IHT Oct 1, 2006  
quoting Joe Sharkey, passenger on Legacy after Diane McNulty

**20 Legacy tail damaged**

Type of Factor: Event

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 01, 2006

**21 Legacy does not see Boeing B737**

Type of Factor: UnEvent

Date/Time:

Actors involved: Embraer Legacy  
Boeing B737-800

Annotation: New York Times  
Oct 01, 2006

quoting Joe Sharkey

**22 Legacy flies stable northwest at FL370**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 01, 2006

quoting Joe Sharkey

**23 Legacy equipped with anticollision device**

Type of Factor: State

Date/Time:

Actors involved: Embraer Legacy  
Collision Avoidance System

Annotation: New York Times  
Oct 01, 2006

quoting "authorities"

**24 Boeing B737 equipped with anticollision device**

Type of Factor: State

Date/Time:

Actors involved: Boeing B737-800  
Collision Avoidance System

Annotation: New York Times  
Oct 01, 2006

quoting "authorities"

**25 Legacy might have flown off course**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 02, 2006

quoting unidentified sources in the Brazilian Air Force

- 26 Boeing B737 might have had trouble**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 02, 2006  
quoting "Others"
- 27 Boeing B737 might have lost parts**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 02, 2006  
quoting "Others"
- 28 Parts of B737 might have hit Legacy**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: New York Times  
Oct 02, 2006  
quoting "Others"
- 29 Possible lack of coordination among air traffic controllers**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Radar operator  
Annotation: IHT  
Oct 03, 2006  
quoting Brazilian news reports
- 30 149 passengers and 6 crew die**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: New York Times  
Oct 04, 2006  
revised to 148 pax, 6 crew by Factor 44
- 31 Possible negligence or disregard for air-traffic instructions**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 04, 2006
- 32 Failure to detect other aircraft**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: New York Times  
Oct 04, 2006
- 33 Air-traffic controllers not alerted of dangerous flight path**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Radar operator  
Annotation: New York Times  
Oct 04, 2006

**34 Crew ignored instruction to descent from FL370 to FL360 passing Brasilia**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 04, 2006

quoting prosecutor Mr. Alves

**35 Crew decided to fly higher without alerting controllers**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 04, 2006

quoting prosecutor Mr. Alves

**36 Boeing B737 flies at FL370**

Type of Factor: Process

Date/Time: 29.09.2006 15:58:00

Actors involved: Boeing B737-800

Annotation: New York Times  
Oct 02, 2006

**37 Boeing B737 visible on radar until accident**

Type of Factor: State

Date/Time:

Actors involved: Boeing B737-800  
AirTrafficControl Manaus

Annotation: New York Times  
Oct 05, 2006

quoting Brazilian Air Force investigators

**39 Technical warning system does not operate as expected**

Type of Factor: UnEvent

Date/Time:

Actors involved: Embraer Legacy  
Collision Avoidance System

Annotation: New York Times  
Oct 05, 2006

quoting Testimony of Legacy pilots

**40 Crew unable to find proper frequency for Manaus controllers**

Type of Factor: UnEvent

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 05, 2006

quoting Testimony of Legacy pilots

**41 No radio contact between Legacy and Brasilia or Manaus until collision**

Type of Factor: State

Date/Time:

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus

Annotation: New York Times  
Oct 05, 2006

quoting Testimony of Legacy pilots

**42 TCAS on board Legacy is turned off or not working**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy  
Collision Avoidance System

Annotation: New York Times  
Oct 05, 2006

quoting procecutor Adriano Alves

**43 Handover from Brasilia to Manaus required**

Type of Factor: Process

Date/Time:

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus

Annotation: New York Times  
Oct 05, 2006

quoting Testimony of Legacy pilots

**44 148 passengers and 6 crew die**

Type of Factor: Event

Date/Time:

Actors involved: Boeing B737-800

Annotation: New York Times  
Oct 06, 2006

revised passenger count by GOL

**45 Controller unable to gauge altitude by radar**

Type of Factor: UnEvent

Date/Time:

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)

Annotation: New York Times  
Oct 06, 2006

quoting Brazilian officials

**46 Single electronic failure on board of the Legacy**

Type of Factor: Assumption

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 06, 2006

quoting Technial Experts

**47 ATC Brasilia makes blind transmission ordering Legacy Crew to switch radio frequencies**

Type of Factor: Event

Date/Time: 29.09.2006 15:51:00

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)

Annotation: New York Times  
Oct 06, 2006

quoting police official

**48 Legacy enters jurisdiction of different ATC Center**

Type of Factor: Event

Date/Time:

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus

Annotation: New York Times  
Oct 06, 2006

quoting police official

**49 Legacy crew misheard frequency**

Type of Factor: Event

Date/Time: 29.09.2006 16:53:00

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)

Annotation: New York Times  
Oct 06, 2006

quoting police official

**50 Crew unable to tune radio correctly**

Type of Factor: Event

Date/Time:

Actors involved: Embraer Legacy

Annotation: New York Times  
Oct 06, 2006

quoting police official

**51 Legacy transponder resumes broadcasting**

Type of Factor: Event

Date/Time: 29.09.2006 17:02:00

Actors involved: Embraer Legacy  
Radar operator

Annotation: New York Times  
Oct 06, 2006

quoting Brazilian officials

**52 Legacy tracked intermittently by primary radar**

Type of Factor: Process

Date/Time: 29.09.2006 16:38:00

Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)

Annotation: New York Times  
Oct 06, 2006

quoting General Pinheiro

refined by Flight International Nov. 21-27, 2006

**53 Primary radar gives no altitude information**

Type of Factor: Un-Event

Date/Time:

Actors involved: Radar operator

Annotation: New York Times  
Oct 06, 2006

**54 Controller does not warn about possible collision**

Type of Factor: Un-Event

Date/Time:

Actors involved: Radar operator

Annotation: New York Times  
Oct 06, 2006

quoting General Pinheiro

- 55 Software requires altitude information for collision warning**  
Type of Factor: State  
Date/Time:  
Actors involved: Radar operator  
Annotation: New York Times  
Oct 06, 2006  
  
deduced from 54
- 56 Legacy Transponder not broadcasting**  
Type of Factor: UnEvent  
Date/Time: 29.09.2006 16:02:00  
Actors involved: Embraer Legacy  
Annotation: New York Times  
Oct 06, 2006  
  
quoting General Pinheiro
- 57 TCAS requires Transponder information for operation**  
Type of Factor: State  
Date/Time:  
Actors involved: Collision Avoidance System  
Embraer Legacy  
Annotation: New York Times  
Oct 06, 2006
- 58 Boeing B737 not advised to change altitude**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: Boeing B737-800  
AirTrafficControl Manaus  
Annotation: New York Times  
Oct 06, 2006  
  
derived from available information and statement from John Cox
- 59 Complete radar and radio coverage over jungle**  
Type of Factor: State  
Date/Time:  
Actors involved: Radar operator  
Annotation: New York Times  
Oct 06, 2006  
  
quoting General Vilarinha
- 60 Discrepancy between Legacy flightpath, altitude and altitude assignment**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 06, 2006
- 61 Legacy does not take evasive action**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: Derived from Crew Testimony
- 62 Assumed Mid-Air Collision**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: superseded by Factor 76

- 63 Both aircraft at FL370**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation:
- 64 Legacy flies at FL370**  
Type of Factor: Process  
Date/Time: 29.09.2006 15:33:00  
Actors involved: Embraer Legacy  
Annotation: Testimony of Legacy Crew
- 65 Both aircraft on same airway**  
Type of Factor: Process  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: Derived from Flightplans
- 66 Legacy TCAS manufactured by Honeywell**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 08, 2006  
quoting ExcelAire
- 67 FAA had ordered recall on TCAS model used in Legacy**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 08, 2006  
quoting ExcelAire  
False information, corrected by New York Times, Oct 09, 2006
- 68 TCAS device tended to stop broadcasting unexpectedly in certain circumstances**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 08, 2006  
quoting ExcelAire  
TCAS on board Legacy was not recalled by FAA, New York Times Oct 09, 2006
- 69 Legacy Flightplan called for FL380 at point of collision**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: New York Times  
Oct 12, 2006  
quoting police officials

- 70 Boeing B737 CVR lost in rainforest**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: New York Times  
Oct 12, 2006  
  
superseded by Factor 74
- 71 Brazilian Air Traffic System run by Brazilian Air Force**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 12, 2006
- 72 Takeoff Clearance called for FL370 for the entire route**  
Type of Factor: Event  
Date/Time:  
Actors involved: Radar operator  
Embraer Legacy  
Annotation: New York Times  
Oct 28, 2006  
  
quoting Crew lawyer Robert A. Torricella Jr.  
  
supported by Factor 75
- 73 ATC instruction supersedes flight plan**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Air Traffic Control at Sao Jose dos Campos Airport, Brazil  
Annotation: New York Times  
Oct 28, 2006  
  
quoting Crew lawyer Roberto A. Torricella Jr.  
  
generalised, following New York Times, Nov 21, 2006
- 74 Boeing B737 CVR found**  
Type of Factor: Event  
Date/Time:  
Actors involved:  
Annotation: New York Times  
Oct 28, 2006
- 75 Legacy cleared by Tower Jose dos Campos for FL370**  
Type of Factor: Event  
Date/Time: 29.09.2006 15:11:00  
Actors involved: Pilot of Embraer Legacy 600XL  
Air Traffic Control at Sao Jose dos Campos Airport, Brazil  
Annotation: AP report, IHT  
Nov 02, 2006  
  
quoting Brazilian newspaper "Folha"  
"Folha" allegedly gained access to CVR transcript  
  
confirmed by Brazilian Air Force preliminary report
- 76 Legacy collides with Boeing B737**  
Type of Factor: Event  
Date/Time: 29.09.2006 16:57:00  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: New York Times  
Nov 21, 2006

- 77 19 unsuccessful attempts to reach ATC Brasilia**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: New York Times  
Nov 21, 2006
- 78 Boeing B737 flight plan called for FL410 at point of collision**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: New York Times  
Nov 21, 2006
- 79 ATC Manaus instructed Boeing B737 to fly at FL370**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
AirTrafficControl Brasila (CINDACTA 1)  
Annotation: New York Times  
Nov 21, 2006
- 80 ATC believed the Legacy to fly at FL360**  
Type of Factor: State  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus  
Embraer Legacy  
Annotation: AP report, IHT  
Dec 05, 2006  
quoting Brig. Gen. Luiz Carlos da Silva Bueno
- 81 Possible Cause for (56)**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation: structural node
- 82 Avionics component has operational problems**  
Type of Factor: State  
Date/Time:  
Actors involved: Collision Avoidance System  
Annotation: AP report, IHT  
Apr 21, 2007  
quoting ExcelAire report to Brazilian federal police
- 83 Avionics component returned to Honeywell**  
Type of Factor: Process  
Date/Time:  
Actors involved: Collision Avoidance System  
Annotation: AP report, IHT  
Apr 21, 2007  
quoting ExcelAire report to Brazilian federal police
- 84 Honeywell returned avionics component to Embraer**  
Type of Factor: Process  
Date/Time:  
Actors involved: Collision Avoidance System  
Annotation: Derived from 83 and 85

- 85 Embraer installed avionics component**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: AP report, IHT  
Apr 21, 2007  
quoting ExcelAire report to Brazilian federal police
- 86 One transponder and some radio communications systems installed in avionics component**  
Type of Factor: State  
Date/Time:  
Actors involved: Collision Avoidance System  
Annotation: AP report, IHT  
Apr 21, 2007  
quoting ExcelAire report to Brazilian federal police
- 87 Cockpit systems do not effectively alert Legacy crew of anti-collision equipment failure**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: Collision Avoidance System  
Embraer Legacy  
Annotation: IHT  
May 03, 2007  
quoting US air safety investigators
- 88 Boeing unable to avoid collision**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation:
- 89 Boeing crew has no visual identification of conflicting traffic**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation:
- 90 Legacy not advised to change altitude**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
Annotation:
- 91 Boeing B737 spirals out of control**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Flight International  
Oct 10-16, 2006
- 92 Boeing B737 breaks up in mid-air**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: Flight International  
Oct 10-16, 2006

- 93 Both aircraft on airway UZ6 in opposite directions**  
Type of Factor: Process  
Date/Time:  
Actors involved: Boeing B737-800  
Embraer Legacy  
Annotation: Flight International  
Oct 10-16, 2006
- 96 Radar coverage limits at boarder between airspace sectors**  
Type of Factor: Unspecified  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Oct 10-16, 2006
- 97 Notoriously unreliable radio communications in area of collision**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Oct 10-16, 2006  
quoting local pilots
- 98 Boeing B737 in contact with Manaus**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
AirTrafficControl Manaus  
Annotation: Flight International  
Oct 10-16, 2006
- 99 Legacy technically under control of ATC Brasilia**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
Annotation: Flight International  
Oct 10-16, 2006
- 100 Controller Brasilia does not warn Legacy**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Embraer Legacy  
Annotation: Splitted up Factor 54
- 101 Controller Manaus did not warn Boeing B737**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: AirTrafficControl Manaus  
Boeing B737-800  
Annotation: Splitted up Factor 54
- 102 No handover of Legacy from Brasilia to Manaus**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: Embraer Legacy  
AirTrafficControl Brasila (CINDACTA 1)  
AirTrafficControl Manaus  
Annotation: Needed factor for Factor 101

- 103 Unknown cause**  
 Type of Factor: Assumption  
 Date/Time:  
 Actors involved:  
 Annotation:
- 104 Legacy winglet severed Boeing B737 hydraulic and electrical lines**  
 Type of Factor: Assumption  
 Date/Time:  
 Actors involved: Boeing B737-800  
 Embraer Legacy  
 Annotation: Flight International  
 Oct. 17-23, 2006
- 105 Legacy winglet compromised Boeing B737 left wing's aileron actuators**  
 Type of Factor: Assumption  
 Date/Time:  
 Actors involved: Boeing B737-800  
 Embraer Legacy  
 Annotation: Flight International  
 Oct. 17-23, 2006
- 106 Legacy winglet deforms Boeing B737 wing**  
 Type of Factor: Assumption  
 Date/Time:  
 Actors involved: Boeing B737-800  
 Embraer Legacy  
 Annotation: Flight International  
 Oct. 17-23, 2006
- 107 Procedure to maintain current flight level "for a short time"**  
 Type of Factor: Process  
 Date/Time:  
 Actors involved: Embraer Legacy  
 Annotation: Flight International  
 Oct. 17-23, 2006  
 citing ICAO procedures for pilots under ATC control by radar, who are aware they have lost communication
- 108 Legacy does not change altitude**  
 Type of Factor: Event  
 Date/Time:  
 Actors involved: Embraer Legacy  
 Annotation: Derived from 64, 90, 107
- 109 Boeing B737 does not take evasive action**  
 Type of Factor: UnEvent  
 Date/Time:  
 Actors involved: Boeing B737-800  
 Annotation: Flight International  
 Oct 21-27, 2006
- 110 ATC Brasilia loses secondary radar information on Legacy**  
 Type of Factor: State  
 Date/Time: 29.09.2006 16:02:00  
 Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
 Embraer Legacy  
 Annotation: Flight International  
 Oct 21-27, 2006

- 111 ATC Brasilia has lost primary radar contact with Legacy**  
Type of Factor: State  
Date/Time: 29.09.2006 16:30:00  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Embraer Legacy  
Annotation: Flight International  
Oct 21-27, 2006
- 112 ATC Brasilia transmits blindly to Legacy**  
Type of Factor: Process  
Date/Time: 29.09.2006 16:26:00  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Embraer Legacy  
Annotation: Flight International  
Oct 21-27, 2006
- 113 Secondary radar information trasmits altitude information**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation:
- 115 ATC monitoring system automatically updates altitude information on controller's display**  
Type of Factor: Process  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Annotation: Flight International  
Dec. 05-11, 2006  
quoting IFATCA
- 116 Lecagy passes waypoint Brasilia**  
Type of Factor: Event  
Date/Time: 29.09.2006 15:56:00  
Actors involved: Embraer Legacy  
Annotation: Flight International  
Dec. 05-11, 2006  
quoting IFATCA
- 117 System "feature": Displayed altitude set to altitude given in flight plan after passing of waypoint**  
Type of Factor: State  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Annotation: Flight International  
Dec. 05-11, 2006  
quoting IFATCA
- 118 Brazilian military 3-d primary radar provides flight altitude information**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Dec. 05-11, 2006  
quoting IFATCA
- 119 Military Primary radar altitude information presented to civilian controllers**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Dec. 05-11, 2006  
quoting IFATCA

- 120 Military 3-D primary radar altitude information inaccurate**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Dec. 05-11, 2006  
  
quoting IFATCA
- 121 Long-Range triangulation**  
Type of Factor: Process  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Dec. 05-11, 2006  
  
quoting IFATCA
- 122 Controller does not trust primary radar altitude information**  
Type of Factor: Assumption  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Annotation:
- 123 Legacy enters UZ6**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation:
- 124 UZ6 connects Manaus and Brasilia**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation:
- 125 Boeing B737 uses UZ6**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation:
- 126 Legacy flightplan**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation:
- 127 Planned altitude change from FL370 to FL360 after passing waypoint Brasilia**  
Type of Factor: State  
Date/Time:  
Actors involved:  
Annotation: Flight International  
Dec. 05-11, 2006
- 128 Planned altitude change from FL360 to FL380 after passing TERES**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation: Flight International  
Oct. 17-23, 2005

- 129 Legacy crew identifies TCAS failure**  
Type of Factor: Event  
Date/Time:  
Actors involved: Embraer Legacy  
Collision Avoidance System  
Annotation: Flight International  
May 8-14, 2007
- 130 TCAS unit displays "TCAS OFF in small white letters on flight display**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Collision Avoidance System  
Annotation: Flight International  
May 8-14, 2007
- 131 ATC shift change**  
Type of Factor: Event  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Annotation: Flight International  
May 8-14, 2007
- 132 Controller's electronic flight strip showed Legacy as assigned to FL360**  
Type of Factor: Event  
Date/Time:  
Actors involved: AirTrafficControl Brasila (CINDACTA 1)  
Embraer Legacy  
Annotation: Flight International  
May 8-14, 2007
- 133 Boeing B737 flightplan requested FL370 as cruise altitude**  
Type of Factor: State  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation: NTSB Safety Recommendation  
May 2, 2007
- 134 No aural warning on TCAS failure**  
Type of Factor: UnEvent  
Date/Time:  
Actors involved: Collision Avoidance System  
Embraer Legacy  
Annotation: NTSB Safety Recommendation  
May 2, 2007
- 135 Boeing B737 does not change altitude**  
Type of Factor: Event  
Date/Time:  
Actors involved: Boeing B737-800  
Annotation:
- 136 Legacy maintains FL370**  
Type of Factor: State  
Date/Time:  
Actors involved: Embraer Legacy  
Annotation:
- 137 Placing of Legacy crew feet might have disabled Legacy communication devices**  
Type of Factor: Assumption  
Date/Time:  
Actors involved:  
Annotation:

## ***Actor List***

GOL Flight 1907	Boeing B737-800
Embraer Legacy	Embraer Legacy
Radar operator	Radar operator
ATC Brasilia	AirTrafficControl Brasila (CINDACTA 1)
ATC Manaus	AirTrafficControl Manaus
TCAS System	Collision Avoidance System
Joseph Lepore	Pilot of Embraer Legacy 600XL
Sao Jose dos Campos Tower	Air Traffic Control at Sao Jose dos Campos Airport, Brazil