

CASTANALYSIS

LEARJET35AACCIDENTINSAOPAULO

IDOALDO J LIMA
CARLOS H N LAHOZ



ABOUT THIS RESEARCH

“Apply CAST to the analysis of an accident in order to understand how it works and generate better recommendations for the brazilian aviation system.”

Select ‘relatively common’ accident reported in CENIPA database to generate ‘generalist recommendations’ (for the whole system)
selected by type of occurrence and type of contributing factors
also by amount of information available

Our Case: The 2007 PT-OVC Learjet 35A crash in Sao Paulo



DISCLAIMER

This contribution refers to public available information from the National Transportation Safety Board about the civil aviation accident involving a Learjet 35A made by Bombardier Inc. and operated by Reali Air Taxi Ltd. under the identification PT-OVC, that took place in 2007 near the Campo de Marte Aerodrome in Sao Paulo.

The views, opinions and assumptions expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Aeronautic Technology Institute or of the Federal University of Itajuba. Examples of analysis performed within this presentation are only examples. They should not be utilized in real-world analytic products as they are based in limited and dated public source information.



PT-OVC LEARJET 35A



Cambridge MA | March 30th '17
Lima, Lahoz, Sousa, Coimbra, Bretanha, Alves (2017)

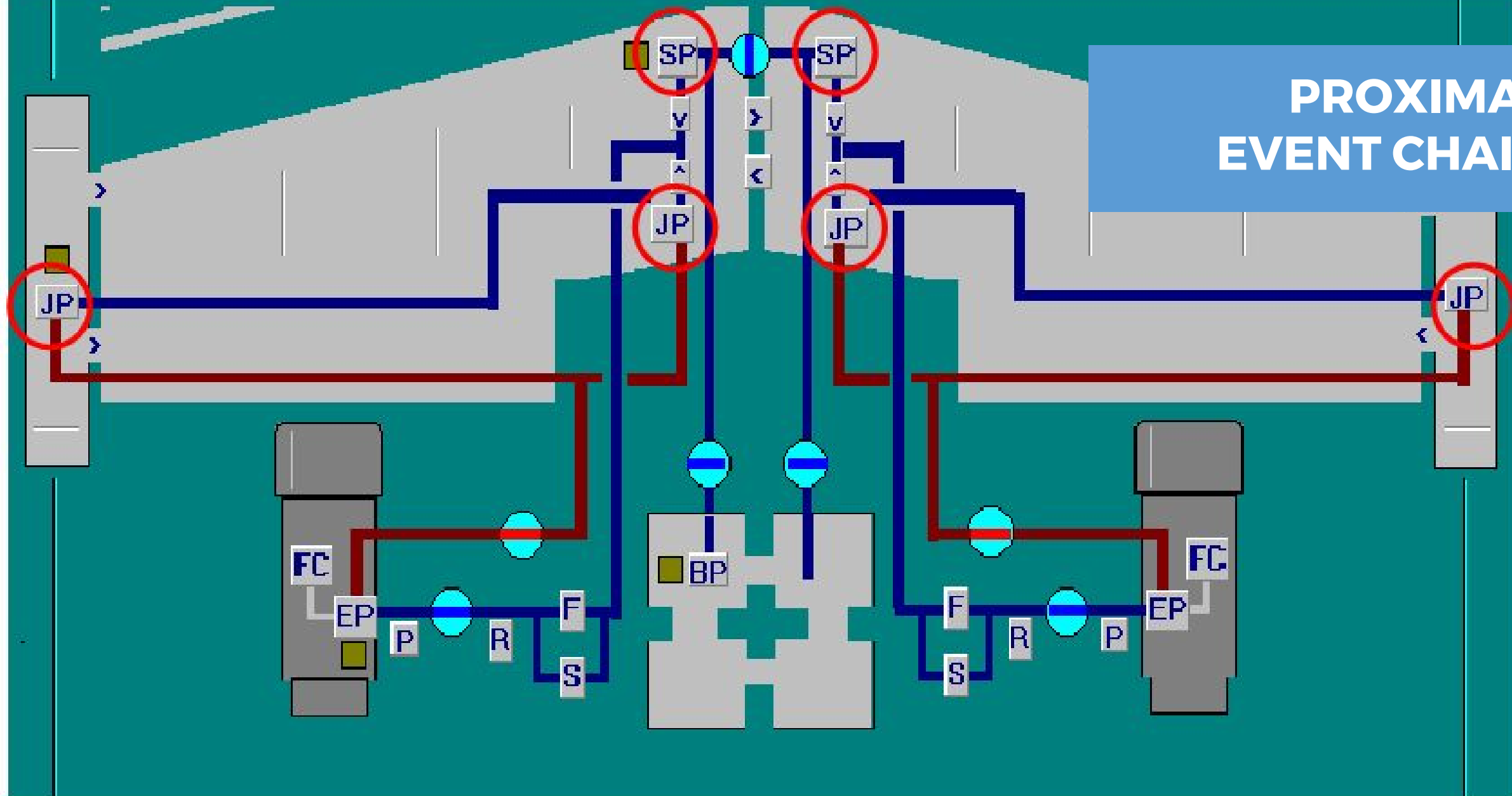


PROXIMAL EVENT CHAIN

- 1. The flight prior to the accident was performed with the Pilot in charge of the piloting without any reported damage or abnormality;**
- 2. During the preparation of the cockpit for the flight, which is performed by the Copilot without the presence of its instructor, a sound similar to the operation of the standby pump and the cross flow valve is emitted for an approximate period of 3 minutes (CVR);**
- 3. At refueling, under Pilot's supervision, 880 lb of fuel is placed through the left wing tip tank supply nozzle and then 880 lb through the right wing tip tank supply nozzle;**



PROXIMAL EVENT CHAIN



PROXIMAL EVENT CHAIN

4. The pilot enters the aircraft and commands the Copilot to initiate the taxiing;
5. The Copilot initiates the taxiing, while the Pilot (instructor), through the cell phone, talks to the Pilot of the helicopter that is in the destination airport;
6. Pilot commands the aircraft during takeoff;
7. The Copilot reports the lateral slippage of the aircraft during takeoff;
8. After the rotation, the aircraft assumes an excessive pitch up attitude;



PROXIMAL EVENT CHAIN

9. The Pilot reports an imbalance in the fuel and requests the Copilot to correct it;
10. The aircraft rises to a height of 1500 feet, leveling the wings momentarily;
11. The aircraft prints a slight curve to the right, gradually increasing the slope to approximately 90deg;
12. At about 1400 feet in height the crew loses flight control capability and the aircraft begins an almost vertical descent;



PROXIMAL EVENT CHAIN

- 13.** A sound similar to the aircraft shaker is issued (CVR);
- 14.** The aircraft impacted against the ground, reaching three houses in the residential area located one nautical mile north-west of Campo de Marte Aerodrome;
- 15.** The two crew members and six persons residing in the houses affected died in the accident;
- 16.** The three houses affected suffered serious structural damage; and the aircraft suffered serious damage from the impact and action of fire.



ADDITIONAL INFORMATION

- i.** The aircraft departed from SBMT on a positioning flight to SBRJ;
- ii.** The takeoff clearance from runway 30 was issued at 2:08pm, and the crew was advised the wind was from 300 degrees at 2 knots;
- iii.** At 2:09pm, the tower controller advised the crew that the turn should be to the left, but the crew did not respond nor did they declare an emergency.
- iv.** Deaths: 1 kid, 5 adults, 2 elderly
- v.** Injured: 2 kids



A photograph showing the wreckage of an aircraft, likely a Learjet 35A, with the registration PT-OVC visible on a piece of the fuselage. Several firefighters in dark uniforms with reflective yellow stripes and helmets are working around the debris. In the background, other personnel in orange and blue uniforms are visible. The scene is outdoors, with buildings and utility poles in the background.

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NEWS REPORTS

NO GUILTY PART ONCE BOTH PILOTS ARE DEAD !!!



globo.com notícias esportes entretenimento vídeos

buscar no g1 ok

/ são paulo / acidente aéreo

04/11/07 - 18h51 - Atualizado em 04/11/07 - 23h28

Coronel diz que avião que caiu em SP 'virou para o lado errado'

Equipes de resgate encontraram o Gravador de Voz da Cabine (CVR). Learjet saiu do Campo de Marte e deveria seguir para o Rio de Janeiro.

Carolina Iskandarian Do G1, em São Paulo

TURNED TO THE WRONG SIDE !!!

o avião que caiu na tarde deste sábado em São Paulo, virou para o lado errado ao sair do Campo de Marte.

Coertura completa
Veja as fotos do acidente
Presenciou o acidente? Mande fotos e

- editorias
- Primeira Página
- Blogs e Colunas
- Brasil
- Carros
- Ciência e Saúde
- Cinema
- Concursos e Emprego
- Economia e Negócios
- Esporte
- Mundo
- Música
- Planeta Bizarro
- Política
- Pop & Arte

ÉPOCA

IMPRIMIR | Imprimir matéria | Tamanho do texto: A- A+

Pane seria causa do acidente

Problema nas turbinas seria principal causa da queda do jato que matou oito pessoas

REDAÇÃO ÉPOCA

Os responsáveis pela investigação afirmaram que o problema principal do acidente teria sido uma pane em uma das turbinas. Um dos fatores mais relevantes para a queda foi o estado das turbinas, que estavam praticamente intactas, a outra

ENGINE SHUTDOWN CAUSED THE ACCIDENT !!!

UOL Mais beta

Publicar

Perícia-SP: Falha humana em acidente com Learjet

IT WAS HUMAN ERROR !!!



CENIPA REPORT

CONTRIBUTING FACTORS

disregard for standards and procedures;
overconfidence;
crew resource management;
pilot judgment; aircraft design (possible);

work overload;
loss of situational awareness;
lack of experience;
human fatigue (possible).

RECOMMENDATIONS

- i. Enhancements on training programs for fuel imbalance, performance limits, flight procedures and human factors;**
- ii. Enhancements on airliner CRM, training program management, operations management and human resources management;**
- iii. Enhancements on regulator safety policies on training programs;**
- iv. Evaluate aircraft project for safety.**



IT HAPPENED AGAIN?

METRÓPOLES 25° Min 20° Máx 29° TRÂNSITO AGORA Pesquisar

DF ENTRETENIMENTO GASTRONOMIA VIDA & ESTILO SAI DO SÉRIO BRASIL MUNDO ESPORTES COLUNAS E BLOGS

Curva indica desequilíbrio de avião que caiu e matou Agnelli

Monomotor que transportava a família do empresário era experimental. Uma das hipóteses prováveis para o desequilíbrio é a distribuição irregular do combustível nas asas da aeronave

ESTADÃO conteúdo
21/03/2016 8:36

f
t

A curva para a direita feita pelo avião de Roger Agnelli, ex-presidente da Vale, indica que o monomotor dele se desestabilizou pouco antes da queda, que terminou com a **morte do empresário**, do piloto e de cinco familiares de Agnelli, no sábado (19/3) na Casa Verde, na zona norte de São Paulo. A

FUEL
IMBALANCE
AGAIN !!!



ACCIDENTS & HAZARDS

System hazards

H1 - aircraft crash against habited houses

H2 - aircraft take off under irregular conditions

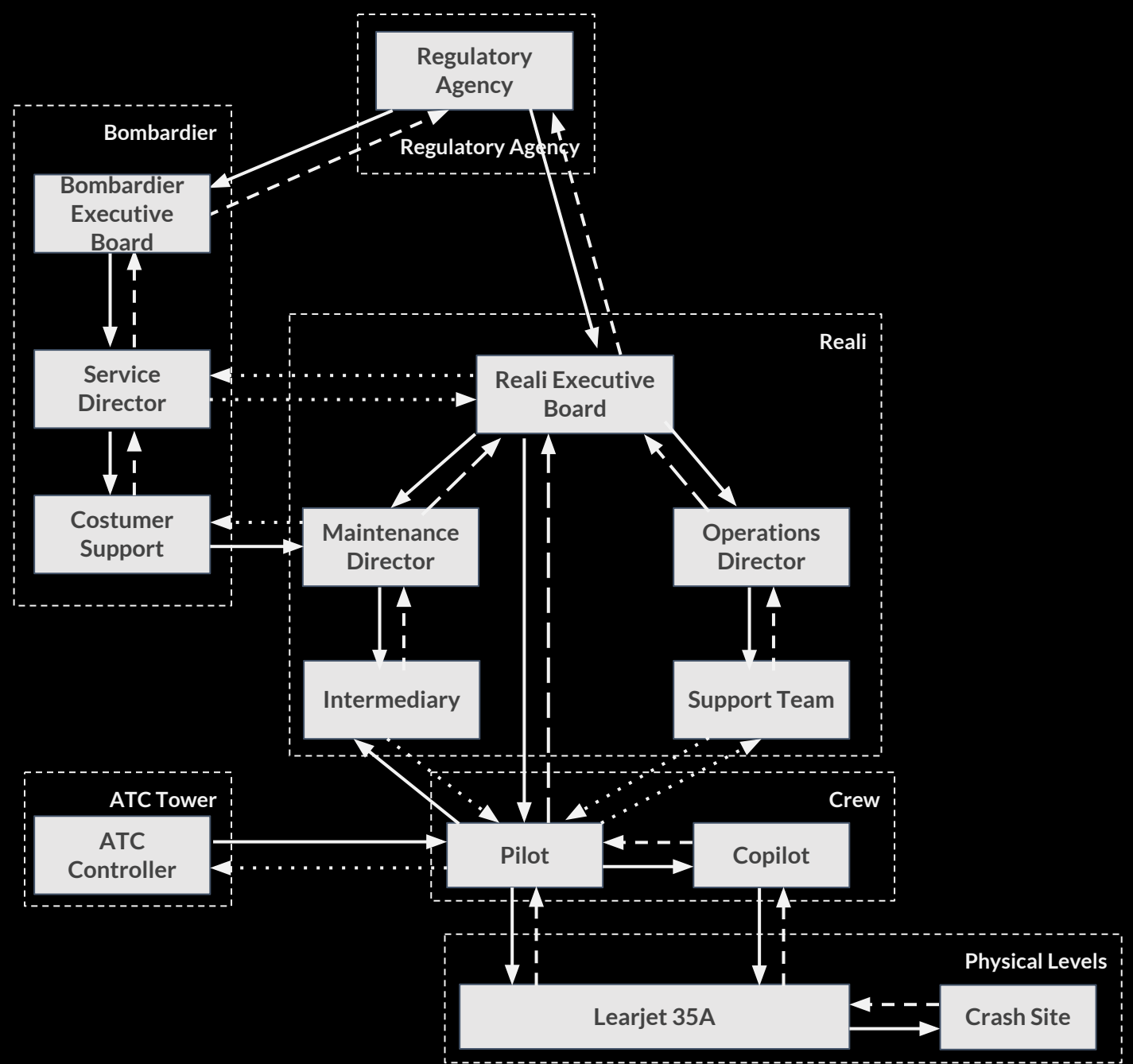
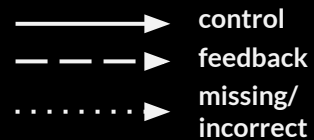
System safety constraints

SC1 - the aircraft must not crash against habited houses

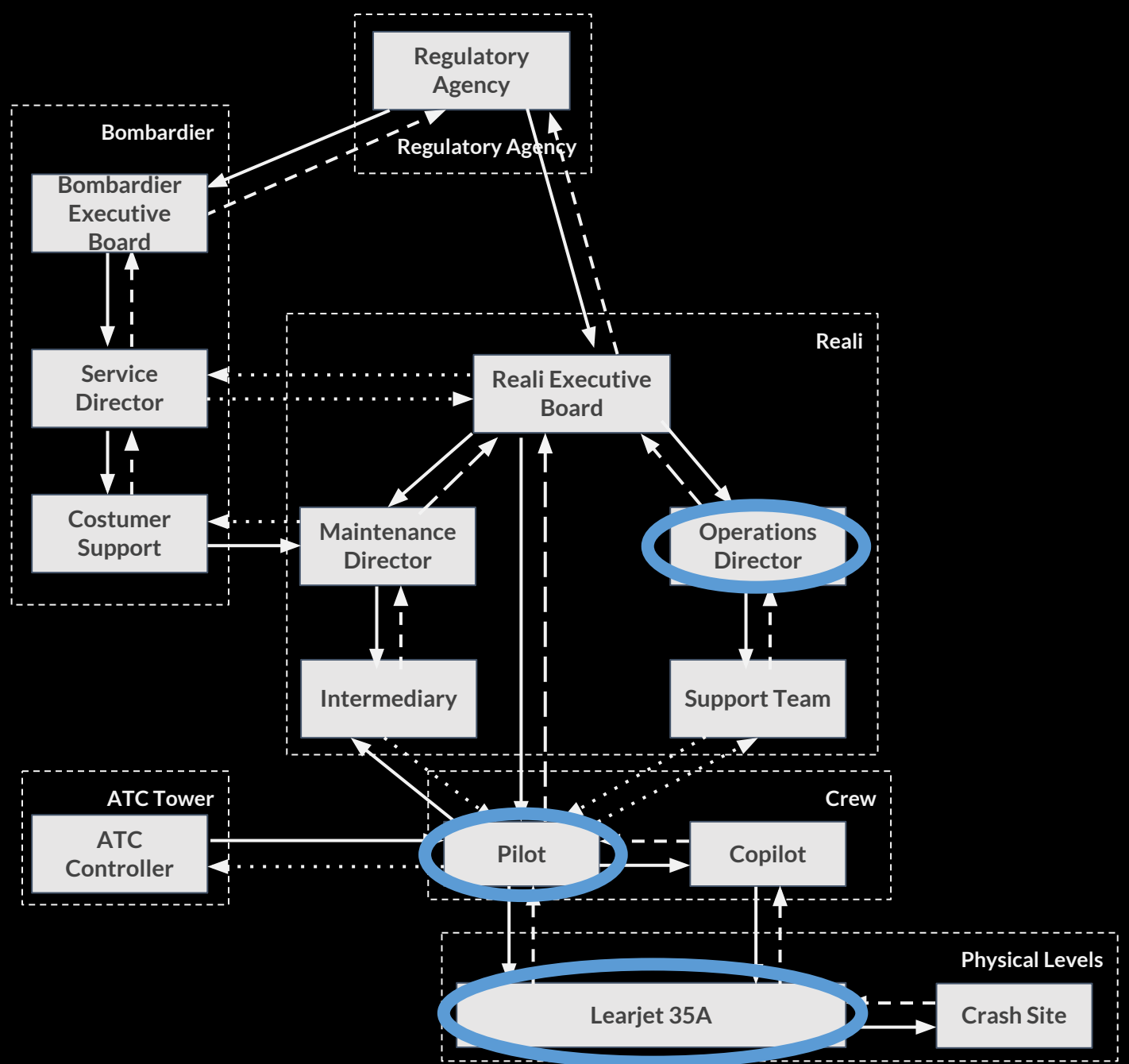
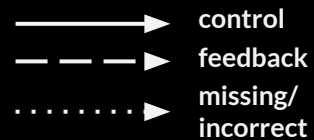
SC2 - the aircraft must not take off under irregular conditions



CONTROL STRUCTURE



CONTROL STRUCTURE



PHYSICAL PROCESSES

LEARJET 35A

Constraints Violated

- Crossflow pumps should not operate inadvertently, only under crew command;
- Aircraft must not take off under inappropriate circumstances;
- Aircraft must not exhibit significant rolling tendency due to fuel imbalance;
- Information on disturbances must be provided to crew.

Physical Controls

- Personal safety equipment;
- Learjet 35A checklist;
- Learjet 35A Flight and Pilot's Manual.



PHYSICAL PROCESSES

LEARJET 35A

Failures, Inadequate Controls and Unsafe Interactions

- Cabin preparation procedure;
- Inadvertent and non-commanded operation of crossflow pumps;
- Inadequate aircraft takeoff and command of pilot and copilot;
- Inadequate information on unsafe aircraft scenarios.

Context

- No report of abnormalities on the prior flight;
- Airworthiness Directive (AD) on the inadvertent operation of fuel pumps (Standby Fuel Pump Annunciators must be installed);
- Moderate rain on runway during takeoff.



HIGHER LEVEL CONTROLLER

PILOT

Safety Responsibilities

- Operate the aircraft in accordance with all rules/guidelines;
- Supervise the Co-pilot's training.

Unsafe Decisions

- Not giving full attention to operation;
- Delegated tasks to Copilot (in training) with no supervision;
- Did not follow procedures for take off;
- Accumulated operating system functions;



HIGHER LEVEL CONTROLLER

PILOT

Process Model Flaws

- Believed the Copilot could carry out tasks by himself;
- Believed the aircraft would endure the attitude imposed;
- Thought was not necessary to follow all procedures.

Context

- Hurry to get to the destination;
- Imminent unfavorable weather conditions;
- Accumulation of organizational functions;
- Was used to fly that way, overconfidence;
- Fuel imbalance.



HIGHER LEVEL CONTROLLER

REALI OPERATIONS DIRECTOR

Safety Responsibilities

- Manage the Reali aircraft operations activities, and collaborators involved, in accordance with Reali procedures and standards and Regulatory Agency regulations.

Unsafe Decisions

- Allowed the operation of the aircraft on a different base from headquarters;
- Enabled coordination of aircraft operating activities directly between Pilot and Reali Executive Board;
- No inspection on Pilot's logbooks;
- No overviews of Co-Pilot's training activities.



HIGHER LEVEL CONTROLLER

REALI OPERATIONS DIRECTOR

Process Model Flaws

- Thought his decisions would not affect/generate hazardous operations.

Context

- Distance between the crew and the Reali headquarters;
- Operations sector did not have control the Learjet35A operations;
- The Learjet 35A was not officially part of the company's operational scope.



SAFETY RECOMMENDATIONS

Higher Level Recommendations & “Good Practice” Recommendations

still more work to do, to understand
full scenario and applicability

Efficient tool not only to understand
hazard in different level of the system,
but understanding the system itself.

Different Priorities for dealing with
hazard

CAST
(53)

OFFICIAL
REPORT
(11)

THANKYOU

IDOALDO J LIMA

IDOALDOLIMA@GMAIL.COM

linkedin.com/idoaldo

+55 35 99152 8377



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