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Airline Pilot Risk Profiling by Using Unstable Approach Management Case

About Me

- Academic Education
  - Ph. D. in Aviation Sciences

    Aviation Safety Concentration

    Florida Institute of Technology, FL, USA
  - Master of Arts in Organizational Change Leadership *(Ongoing)*

    Western Michigan University, MI, USA
  - Master of Science in Aviation

    Applied Aviation Safety

    Florida Institute of Technology, FL, USA
  - Bachelor of Science

    Electronics Engineering

    Istanbul F. University, TURKEY
- Professional Experiences
  - Western Michigan University

    Assistant Professor

    College of Aviation (2021-present)
  - Qazaq Air

    Head of Compliance Monitoring and IATA-IOSA Project Manager (6 Months)
  - Air Albania

    Founder and Head of Safety & Security and Compliance Monitoring (2 years)
  - Turkish Airlines

    SMS Administrator (3 years)

    Pilot Training Coordinator at Florida Tech. (2,5 years)

    Line Maintenance Engineer (3 years)

About the Research

- This research was conducted at one of major European airlines before Covid.
- The main theoretical structure was designed in my master thesis, the design has been improved and updated for this research.

Researcher and Agenda

- Researcher
  - Selim Ozyurek, PhD

    Assistant Professor, College of Aviation, Western Michigan University

- Agenda
  - Problem Statement
  - Purpose Statement
  - Research Question
  - Research Tools
  - Research Design
  - Results
  - Discussion

Problem Statement

- IATA Global Aviation Data Program Statistics Report for 2011-2015 Term:
  - The approach and landing phases of flight account for the major proportion of all commercial aircraft accidents; 65% of the total accidents.
  - Unstable approaches were identified as a factor in 14% of those accidents.

Purpose Statement

- The purpose of this study is to investigate the predictors of pilots' opinions to land or to go around after an unstable approach.

- Following factorial sets have been investigated as predictors:
  - Demographic factors:

    Age, gender, country of origin, marital status, number of children, experience in years, cockpit rank (CPT/FO), flight hour at current aircraft type, total flight hour, commuting time, self confidence, flight training school (military/civil).
  - Airline management factors:

    Job satisfaction, corporate safety perception, company (airline) management perception, fight scheduling perception, and fleet type manager discussion*.

    *This discussion is company management procedure. Actual pilots discuss the approach that was identified as unstable with the fleet manager

Research Question

- What are the affects of predictors on pilots complete landing or go-around decision outcome after an unstable approach?

Research Design and Methodology

- The research design was a correlational design in nature.
- Logistic regressions were performed to investigate decision outcome.
- Multiple linear regressions were conducted to investigate cause-effect relations.

Research Tools

- A survey questionnaire with Likert type scales was employed as data collection.
- An approach scenario was structured from airline monthly safety bulletins and manipulated by the Flight Operations VP and researchers.
  - After first draft, scenario has been simulated with 36 technical pilots who had managerial roles beside their flight duties.
  - Based on their feedback, the scenario has been manipulated once more.
- The scenario was presented to participants and their decisions (Complete landing or Go-around) were asked.

Results- Participants

Table 1

Descriptive Summary of Participants

	Mean	Std. Deviation	Minimum	Maximum
Age	43,98	9,300	23	64
Experience in Years	18,81	11,802	1	48
Total Flight Hour	9204,82	5962,654	250	25000
Flight Hour at Current Fleet	4151,14	3059,487	60	17500

Note: $N = 490$

A320	Cockpit Rank	CPT	102
		F/O	53
	Total		155
A330	Cockpit Rank	CPT	66
		F/O	37
	Total		103
B737	Cockpit Rank	CPT	97
		F/O	57
	Total		154
B777	Cockpit Rank	CPT	55
		F/O	23
	Total		78
Total	Cockpit Rank	CPT	320
		F/O	170
	Total		490

Results- Descriptive Statistics of Decision Outcome

Table 2

Participant responses based on their fleet

			Decision Outcome				
			Complete Landing		Go-around		Total
A320	Cockpit Rank	CPT	16	15,7%	86	84,3%	102
		F/O	9	17,0%	44	83,0%	53
	Total		25	16,1%	130	83,9%	155
A330	Cockpit Rank	CPT	13	19,7%	53	80,3%	66
		F/O	8	21,6%	29	78,4%	37
	Total		21	20,4%	82	79,6%	103
B737	Cockpit Rank	CPT	11	11,3%	86	88,7%	97
		F/O	11	19,3%	46	80,7%	57
	Total		22	14,3%	132	85,7%	154
B777	Cockpit Rank	CPT	9	16,4%	46	83,6%	55
		F/O	5	21,7%	18	78,3%	23
	Total		14	17,9%	64	82,1%	78
Total	Cockpit Rank	CPT	49	15,3%	271	84,7%	320
		F/O	33	19,4%	137	80,6%	170
	Total		82	16,7%	408	83,3%	490

Results- Inferential Statistics, Assumptions

- Logistic regression assumptions and linear regression assumptions were tested and satisfied.

Results- Inferential Statistics, All Fleets

- A logistic regression analysis was conducted to test if following variables have significant affects

Independent Variables	Dependent Variable
Demographics (Age, gender, nationality, marital status, number of children, commuting time, experience in years, total flight hour, flight hour at current fleet, Cockpit rank (CPT/FO), Pilot training background (Military/Civil)	Go-Around Decision Outcome
Self Confidence	
Flight Scheduling Perception	
Corporate Safety Perception	
Company Management Perception	
Type Manager Perception	

Results- Inferential Statistics, All Fleets

- Logistic regression analysis result indicated that:
  - The Wald criterion demonstrated that none of the predictors made a significant contribution to prediction as whole.
  - Following parameters have approached the significance level:
    - Company management perception (p = 0.059)
    - Corporate safety perception (p = 0.104)

  Because they were practical significant parameters, further evaluations were reviewed.

Results- Inferential Statistics, All Fleets

- Logistic regression analysis result indicated that:
  - Further evaluations on practical significant parameters have indicated that:
    - Exp(B) value indicated that when company management perception is raised by one unit the odds ratio is 14 times as high.

      Therefore, pilots are 14 times more likely to execute a go-around.

    - Exp(B) value indicated that when corporate safety perception is raised by one unit the odds ratio is 7 times as low.

      Therefore, pilots are 7 times more likely to execute a go-around.

Results- Inferential Statistics, Fleet Based

- Logistic regression was conducted to test if following variables have significant affects:

Independent Variables	Dependent Variable
Demographics (Age, gender, nationality, marital status, number of children, commuting time, experience in years, total flight hour, flight hour at current fleet, Cockpit rank (CPT/FO), Pilot training background (Military/Civil)	Go-Around Decision Outcome
Self Confidence	
Flight Scheduling Perception	
Corporate Safety Perception	
Company Management Perception	
Type Manager Perception	

Results- Inferential Statistics, Fleet Based

- Based on the management request, linear regression analysis was conducted to test if following variables have significantly affects:

Independent Variables:

- Self Confidence
- Flight Scheduling Perception
- Corporate Safety Perception
- Company Management Perception
- Type Manager Perception

Dependent Variables:

- Job Satisfaction
- Type Manager Discussion Perception

Results- Inferential Statistics, Fleet Based

Table 3

Fleet based logistic regression and linear regression results

	Independent Variables						Dependent Variable
Fleet	Job Satisfaction	Self-confidence	Flight Scheduling Perception	Corporate Safety Perception	Company Management Perception	Type Manager Perception	
A320	p = 0.039, Exp(B)=17						Go around
			β = 0.17, p = 0.012	β = 0.21, p = 0.002			Job Satisfaction
			β = 0.29, p = 0.008		β = 0.28, p = 0.057		Type Manager Discussion
A330			p = 0.034, Exp(B)=5				Go around
				β = 0.42, p = 0.001		β = 0.22, p = 0.003	Job Satisfaction
	β = 0.38, p = 0.003						Type Manager Discussion
B737		p = 0.010, Exp(B)=5		p = 0.052, Exp(B)=19			Go around
				β = 0.20, p = 0.015	β = 0.23, p = 0.008	β = 0.10, p = 0.034	Job Satisfaction
	β = 0.29, p = 0.034				β = 0.35, p = 0.015		Type Manager Discussion
B777		p = 0.068, Exp(B)=26	p = 0.033, Exp(B)=23	p = 0.068, Exp(B)=32			Go around
			β = 0.15, p = 0.054				Job Satisfaction

Results- Inferential Statistics, A320 Fleet

- When the other variables are controlled:
  - DV: Go Around Decision Outcome (Logistic Regression):
    - 1 unit increase in Job Satisfaction, increases the odds of Go-around 17 times.
  - DV: Job Satisfaction (Multiple Linear Regression):
    - 1 unit increase in Flight Scheduling Perception, there is an associated 17% increase.
    - 1 unit increase in Corporate Safety Perception, there is an associated 21% increase.
  - DV: Type Manager Discussion Perception (Multiple Linear Regression):
    - 1 unit increase in Flight Scheduling perception, there is an associated 29% increase.
    - 1 unit increase in Company Management Perception, there is an associated 28% increase.

Results- Inferential Statistics, A330 Fleet

- When the other variables are controlled:
  - DV: Go Around Decision Outcome (Logistic Regression):
    - 1 unit increase in Flight Scheduling Perception, increases the odds of Go-around 5 times.
  - DV: Job Satisfaction (Multiple Linear Regression):
    - 1 unit increase in Corporate Safety Perception, there is an associated 42% increase.
    - 1 unit increase in Type Manager Discussion Perception, there is an associated 22% increase.
  - DV: Type Manager Discussion Perception (Multiple Linear Regression):
    - 1 unit increase in Job Satisfaction perception, there is an associated 38% increase.

Results- Inferential Statistics, B737 Fleet

- When the other variables are controlled:
  - DV: Go Around Decision Outcome (Logistic Regression):
    - 1 unit increase in Self-confidence, increases the odds of Go-around 5 times.
    - 1 unit increase in Corporate Safety Perception, increases the odds of Go-around 19 times
  - DV: Job Satisfaction (Multiple Linear Regression):
    - 1 unit increase in Corporate Safety Perception, there is an associated 20% increase.
    - 1 unit increase in Company Management Perception, there is an associated 23% increase.
    - 1 unit increase in Type Manager Discussion Perception, there is an associated 10% increase.
  - DV: Type Manager Discussion Perception (Multiple Linear Regression):
    - 1 unit increase in Job Satisfaction perception, there is an associated 29% increase.
    - 1 unit increase in Company Management Perception, there is an associated 35% increase.

Results- Inferential Statistics, B777 Fleet

- When the other variables are controlled:
  - DV: Go Around Decision Outcome (Logistic Regression):
    - 1 unit increase in Flight Scheduling Perception, increases the odds of Go-around 23 times.
  - DV: Job Satisfaction (Multiple Linear Regression):
    - 1 unit increase in Flight Scheduling Perception, there is an associated 23% increase.

Discussion

- Safety Culture
  - Demographic factors were not statistically significant predictors of go-around decision.
  - Regardless of fleet type, participants were obeyed the operational procedures and mostly selected to execute go-around.
  - This may be a good indication of mature safety culture.

Discussion

- Safety Culture
  - Corporate safety culture perception was expected to be a significant predictor of go-around decision; however, the data have not supported researcher expectation.
    - This might be a good indication of safety culture that pilots initiate go-around when it is needed.
    - This may not be a good indication that pilots' decisions were not affected (improved) by safety department activities.

Discussion

- Safety Culture
  - Company management perception and type manager communication were not predictors of executing a go-around decision.
    - This might be an indication that when it comes to go-around decision making, pilots were not affected by management strategies.

Discussion

- Safety Culture
  - Flight scheduling perception was a significant predictor of A330 pilots' and B777 pilots' go-around decision.
  - Flight scheduling perception was not significant predictor of narrow-body aircraft pilots' go-around decision.
  - Wide-body aircraft pilots usually make 4-5 long range flights per month. Low number of duty assignments make them sensitive on their flight schedule assignments.
  - It can be concluded that low number of flight duty assignments make wide-body aircraft pilots more safety sensitive.

Discussion

- The research airline was using B777 fleet mostly for long-haul flights. A330 fleet was performing also short-haul and medium range flights.
- Compared to A330 pilots, B777 pilots had almost 5 times higher probability of executing a go-around.
- It can be argued that:
  - Number of flight duty assignments can affect pilots' attitude. Landing focused pilots' risk perception is not at the same level with the pilots who are ready to go-around.
  - If number of duty assignments decreases, go-around possibility may increase.

Limitation

- No operational pressure
  - As a major limitation for the study that there was no pressure of the real-life flight operation circumstances.
  - Aircraft's fuel condition, time schedule delays, weather circumstances, potential technical malfunction may force to complete landing.
- Less variability
  - Because p values were at 0.05 level, the presented scenario may not be manipulative enough to make clear distinction between go-around and complete landing.

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The End.
Q&A

Thank you!
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