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Final Report No. 2055 by the Aircraft Accident Investigation Bureau

concerning the serious incident (AIRPROX) involving PJS 303, Cessna C550, registration HB-VNZ operated by Jet Aviation Business Jet AG and KLM 59Z, Boeing 737-300, registration PH-BTD operated by KLM Royal Dutch Airlines on 8 April 2008 at 19:40 UTC on the apron of GIA, Geneva International Airport

General remarks concerning this report

This report contains the AAIB's conclusions on the circumstances and causes of the accident/serious incident which is the subject of the investigation.

In accordance with art 3.1 of the 9th edition, applicable from 1 November 2001, of Annex 13 to the Convention on International Civil Aviation (ICAO) of 7 December 1944 and article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the French language

All times in this report, unless otherwise indicated, follow the coordinated universal time (UTC) format. At the time of the accident, central European summer time (CEST) applied as local time (LT) in Switzerland. The relation between LT, CEST and UTC is: LT = CEST = UTC + 2 h.

Final report			
Aircraft	PJS 303, Cessna Citation 550, registration HB-VNZ Jet Aviation Business Jet AG		
	From Geneva LSGG to Zurich LSZH Unscheduled IFR commercial flight and		
	KLM 59Z, Boeing 737-300, registration PH-BTD KLM Royal Dutch Airlines		
	From Amsterdam EHAM to Geneva LSGG Scheduled IFR commercial flight		
Crews	PJS 303 CMD – PIC Type rating instructor TRI, Swiss nationality; born 1964 Captain, LIne Flying Under Supervision LIFUS, trainee commander, Swiss nationality; born 1961		
	KLM 59ZCMD:not communicatedFO:not communicated		
Location	LSGG apron, intersection OUTER – taxiway DELTA		
Date and time	8 April 2008, 19:40 UTC		
ATS unit	TERMINAL CONTROL GENEVA TCG; Aerodrome Control TWR/ADC		
AMS GIA unit	Apron Management Service Geneva International Airport		
Controllers	Apron controller		
Airspace	on the ground, on the apron of Geneva Airport		

1 Factual information

1.1 History of the incident

On the evening of 8 April 2008 at 19:30:24 UTC, the Citation 550 type aircraft PJS 303, registration HB-VNZ, called Geneva APRON on the 121.750 MHz frequency. It was on the TAG Aviation parking area, in position Delta 4 and requested start-up for a flight to Zurich. Geneva APRON cleared it for start-up. Night fell at 18:41 UTC.

The two pilots constituting this crew were captains. In the left-hand seat, the pilot flying (PF) was carrying out line flying under supervision (LIFUS); in the right-hand seat, his instructor pilot, the pilot non flying (PNF), was supervising him and performing the tasks of copilot. At 19:35:08 UTC, the crew requested taxi clearance. Geneva APRON cleared them to taxi to the holding point for runway 23, using the OUTER taxiway. The crew read back this clearance.

The instructor commander stated that he had received the taxi clearance without any condition or traffic information and that at a certain moment he had noticed an aircraft in landing phase on runway 23.

Flight KLM 59Z, a type B737-300, landed on runway 23 on a flight from Amsterdam. At 19:39:43 UTC, the pilot, after his transfer by aerodrome control (ADC) from the 118.700 MHz frequency to that of Geneva APRON on 121.750 MHz, reported that he had vacated runway 23 and was taxiing on taxiway DELTA. Geneva APRON cleared him to taxi to his parking stand, stand 10, using the LINK 4 taxiway.

At 19:40:00 UTC the Citation on the OUTER taxiway was approaching the intersection with taxiway DELTA and was passing just in front of the B737 at 19:40:10 UTC (see ANNEX 1 SAMAX images).

According to his statements, the apron controller had not followed the progress of the Citation on the Swiss Airport Movement Area Control System – SAMAX display.

According to the statement of the commander of the PJS 303 aircraft, the crew heard a radio communication exchange between aircraft KLM 59Z and Geneva APRON whilst taxiing close to satellite 30. However, they did not pay attention to the content of the message. The instructor was busy with his tasks of supervising the pilot in control of the aircraft.

The crew did not receive the instruction to give way to an arriving aircraft and were surprised to hear, a few seconds later, the pilot of aircraft KLM 59Z report that he had had to brake sharply at the last moment.

The unfavourable meteorological conditions created a lighting reflection phenomenon on the tarmac due to the rain. Night-time visibility in general was affected by this for both the pilots and for APRON control.

According to his statements, the pilot of aircraft KLM 59Z had to brake sharply to avoid a collision with the Citation. At 19:40:08 UTC, he remarked on the APRON

frequency that the aircraft which was taxiing on the OUTER taxiway had not been reported to him.

At 19:40:12 UTC, Geneva APRON requested KLM 59Z to give priority to this traffic and to taxi behind it towards the parking stand which had been assigned to it, to which the pilot replied "*roger taxi behind the Citation, hum little bit late, KLM59 Zulu".* The controller replied: "*sorry*".

The crew of aircraft KLM 59Z stated that the Citation was taxiing very quickly and that a collision would have been inevitable if they had not made an emergency stop.

According to the SAMAX system recordings, PJS 303 travelled 610 metres between taxiways ECHO and DELTA in 70 seconds, corresponding to an average speed of 17 knots.

1.2 Meteorological conditions

Weather: skyguide Infonet Data

ATIS Geneva INFO ROMEO RWY IN USE 23 D 0424 N 1841 GRASS RUNWAY is CLOSED QAM LSGG 1920Z 08.04.2008 VRB 2 KT VIS 6 KM LIGHT DRIZZLE CLOUD FEW 100 FT. OVC 600 FT +2/+ 1 QNH 1005 ZERO FIVE NOSIG

METAR MétéoSuisse

GENEVA 19:50 VRB01KT 5000 – SHRA FEW 001 BKN 006 OVC 015 03/01 Q 1005 NOSIG

1.3 Transcription of the recording of the AMS 121.750 MHz frequency

The transcription times shown on the document provided by the AMS do not coincide with those observed on the SAMAX replay at skyguide, reported below.

The times recorded by the AMS are produced by the internal clocks of two different and unsynchronised computers. The time of the transcription provided do not therefore correspond to the actual time of the events.

SAMAX	AMS	FROM	
19:30:24 UTC	<i>19:31:06</i> UTC	PJS 303	"Apron, bonsoir, Jet Aviation three O three, Delta four, request Hem Start up"
19:30:29 UTC	<i>19:31:12</i> UTC	Apron	"Jet three zero three roger start up is approved
19:30:32 UTC	<i>19:31:15</i> UTC	PJS 303	"Start up approved Jet three O three"
19:35:08 UTC	<i>19:35:51</i> UTC	PJS 303	"Jet Aviation three O three request taxi"
19:35:12 UTC	<i>19:35:55</i> UTC	Apron	"Jet three zero three; taxi to holding point two three via the Outer"
19:35:15 UTC	<i>19:35:59</i> UTC	PJS 303	"Taxi two three via the Outer Jet three O three"
19:39:43 UTC	<i>19:40:05</i> UTC	KLM 59Z	"Ground, good evening, KLM five niner Zulu, vacated, Hum, two three at Delta"
19:39:49 UTC	<i>19:40:11</i> UTC	Apron	"KLM five niner Zulu roger"
19:39:54 UTC	<i>19:40:37</i> UTC	Apron	"Taxi via Link four to stand one zero"
19:39:57 UTC	<i>19:40:41</i> UTC	KLM 59Z	"Link four to stand one zero"
19:40:03 UTC	<i>19:40:45</i> UTC	Apron	"Jet three zero three hum "
19:40:08 UTC	<i>19:40:51</i> UTC	KLM 59Z	"And hum KLM five niner Zulu, you didn't mention the Citation"
19:40:12 UTC	<i>19:40:55</i> UTC	Apron	"KLM five nine Zulu give way to Citation coming from hum right to left and behind taxi via Link four to stand one zero"
19:40:19 UTC	<i>19:41:03</i> UTC	KLM 59Z	"Roger taxi behind the Citation, hum little bit late, KLM five nine Zulu"
19:40:23 UTC	<i>19:41:06</i> UTC	Apron	"Sorry"
19:40:24 UTC	<i>19:41:08</i> UTC	Apron	"Jet three zero three, contact Tower on one one eight decimal seven Good bye"
19:40:28 UTC	<i>19:41:11</i> UTC	PJS 303	"eighteen seven bye Jet zero three"

1.4 Additional information

Airport environment

Ref.: Air Rules

1.4.1 Definitions

Movement area

Part of an aerodrome used for take-offs, landings and movement of aircraft on the ground, including the manoeuvring area and aprons.

Manoeuvring area

Part of an aerodrome used for take-offs, landings and movement of aircraft on the ground, with the exclusion of the aprons or tarmac.

Apron, tarmac

Defined area, on a terrestrial aerodrome, intended for passenger embarkation and disembarkation, cargo loading and unloading, refuelling, parking and aircraft maintenance.

See ANNEX 2: AIP LSGG AD 2.24.2 - 1 (28.09.2006)

1.4.2 Apron management

Ref.: ICAO Annex 14 chap. 9.5 - Aerodromes

Recommendation – It is recommended, when the volume of traffic and operating conditions justify it, that an appropriate apron management service be provided, on an apron, by an aerodrome ATS unit, by another airport administration or by these two bodies working in cooperation, in order to ensure:

a) regulation of movements in order to prevent collisions between aircraft or between an aircraft and an obstacle;

b) regulation of the entry of aircraft onto the tarmac and, in liaison with the aerodrome control tower, coordination of the movements of aircraft leaving this area;

c) the safety and rapidity of vehicle movements and regulation of the other activities according to the requirements.

It is recommended that, when the aerodrome control tower does not participate in the apron management service, procedures be established in order to facilitate the transfer of aircraft between the apron management unit and the aerodrome control tower.

1.4.3 Competencies of the GIA

Ref.: AIP SWITZERLAND LSGG AD 2 - 19

The airport authority is operating "Geneva Apron" (way securing service) for arriving aircraft on South Apron.

Ref. Convention GIA-skyguide dated 23/01/2007 :

GIA accordingly provides the management services for the South area; in particular, the competencies of the GIA include taxi clearances on the apron.

1.4.4 Apron Management Service – AMS

The AMS is the GIA organisation which provides apron management services. This service's callsign is APRON, or TRAFIC in the French phraseology. The allocated frequency is 121.750 MHz.

The duty roster provides for two controllers at the workstation until 20:30 LT (18:30 UTC). Between 20:30 and 21:00 the T4 controller is on a break. Between 21:00 and 22:00, the N5/N6 controller is on a break. The breaks are taken as a function of the traffic and are taken in the room adjacent to the service.

According to the controller's statements, the custom is that from 19:00 UTC, if traffic permits, the controller finishing at 20:00 UTC may, by agreement with his colleague and in accordance with the service management's directives, be released early. This was the case on the evening in question.

1.4.5 Apron controller

Ref.: Ordinance concerning air navigation services personnel art. 58; CC 2008

The current situation regarding the provision of air navigation services on apron taxiways is no longer compatible with international regulations. For some time traffic control on the apron and on certain taxiways has been provided by the airport operator (GIA). In other words, the airport operators are performing a task which, in part at least, is the responsibility of the air traffic control service.

Directive 2006/23/CE defines the "air navigation services" as a service provided for the purpose of preventing collisions between aircraft and, on the manoeuvring area, between aircraft and obstacles, and expediting and maintaining an orderly flow of air traffic;

According to the definition given by the ICAO, on a terrestrial aerodrome the apron is the defined area intended for aircraft during passenger embarkation and disembarkation, loading or unloading mail or cargo, fuelling or refuelling, parking or maintenance.

As soon as an aircraft is moving by its own means, it is on a taxiway which forms part of the manoeuvring area and is therefore under the air navigation services. The apron taxiways are also part of the taxiways. Integration into the bilateral accords on the regulations relating to the single European airspace implies that all the air traffic control service providers are evaluated on the basis of the ESARR and are certificated in accordance with the joint requirements. This also includes compliance with the regulations regarding training and in-service training of air traffic controllers. Persons providing air traffic control services are obliged to possess a licence (cf. ICAO standards, directives 2006/23/EC and ESARR 5). The transitional period provided up to 31 May 2010 should allow sufficient time to implement the above-mentioned provisions.

1.4.6 General traffic procedures

Ref. Air Rules

Art. 16 Aircraft converging head-on

When two aircraft moving on the movement area are converging head-on, or nearly head-on, and there is therefore a risk of collision, the two pilots shall stop or, if possible, deviate to the right.

Art. 21 Converging routes

When two aircraft are on converging routes, on the movement area or in flight, at approximately the same level, the one coming from the right has priority.

1.4.7 Local traffic procedures

Ref.: Convention AIG – skyguide ; Annex 1

By runway 23, transfer of communication from aerodrome control TWR/ADC to the APRON service takes place on vacating the runway. ADC may effect the transfer of communication to APRON prior to leaving the runway. At the DELTA and ECHO hot spots, the runway must be vacated without delay. AMS initiates a coordination if traffic must be maintained on the ECHO or DELTA taxiway.

Ref.: AIP SWITZERLAND LSGG AD 2.24.2 - 1 (28.09.2006)

"All arriving aircraft shall expedite vacating the concrete runway. When instructed by "Geneva Tower", contact "Geneva Apron" on FREQ 121.750 MHz. Pilot shall be in contact with "Geneva Apron" prior to entering OUTER TWY".

"The hotspots on the south area draw the flight crew's attention on the potential conflict, when taxiing on the OUTER TWY, with traffic vacating at D or E. In case of doubt, flight crews should stop on the OUTER TWY and wait for instructions.

1.4.8 APRON procedures operating manual; extracts:

Responsibilities in the 3 categories of visibility

- 1. The pilot and controller share responsibility, but the controller's instructions take precedence, as he is able to foresee conflicts and take the necessary control measures to prevent them.
- 2. The pilot ensures his own separation from the aircraft in front of him, but each lateral separation (intersections) must be ensured by the controller.
- 3. Visual observation is impossible for the pilot and the controller. The controller must therefore ensure both lateral separation and sufficient and satisfactory longitudinal distance.
- 1.4.8.1 Procedures for use of the SAMAX system by apron controllers. Ref. AIG order for Geneva APRON dated 20.09.2004, extracts.

(...) At ARRIVAL, obligatory in LVP and recommended in CAT 1, the APRON controller must ensure identification of the aircraft vacating the runway and entering into radio contact with him. He must ensure that the CALLSIGN on the label corresponds to the expected movement. He must also request the pilot to keep his transponder on if the latter is off, or to maintain the assigned code if the pilot replaces it with A2000 or A0000, for example. All this is for the benefit of the APRON controller who handles the movement in question until arrival at the stand. (...)

1.4.9 Supervision aid; the SAMAX system

SAMAX Swiss Airport Movement Control System is a detection tool for guiding and controlling ground movements, based on advanced technologies, Advanced -Surface Movement Guidance and Control System A-SMGCS, which must guarantee the required level of safety at all times.

All aircraft and vehicles moving on the manoeuvring area or tarmac can be displayed in real time on a screen at the controller's workstation.

The development of the SAMAX system consists of four phases. Phase 1 is currently operational at Geneva. This phase provides Advanced Surveillance, at the A-SMGCS level of development. It allows display of the positions and identification of targets.

SAMAX is a joint Skyguide, Zurich-Unique and GIA project.

1.4.9.1 Principle of operation

Among other things, SAMAX uses the signals sent by transponders operating in mode S installed onboard aircraft. Service vehicles – runway, security, ambulance, etc. – are displayed if they are equipped with a VEELO beacon. These signals are detected by a battery of receivers distributed around the airport perimeter. The processing mode by multilateral iteration of these data is termed MultiLATeration - MLAT.

The determination of the precise position of each vehicle or aircraft takes place in real time on the basis of at least three different signal receivers correlated by the host computer.

2 Analysis

2.1 Operational aspects

2.1.1 The crew of aircraft PJS 303

On 8 April 2008, the crew of aircraft PJS 303 carried out training and familiarisation flights with runway circuits on a neighbouring aerodrome.

The last flight of the day was intended to reposition the aircraft and crew in Zurich. Clearance – without any particular restriction or instruction – was given to the crew to taxi from its location – parking Delta 4 – on the OUTER taxiway to the holding point for runway 23. The term "restriction" or "instruction" means, for example: an explicit request to taxi at a slow or moderate speed, to stop at a precise point, to give priority to other traffic, or to report on approaching taxiway ECHO. This latter instruction is, according to the statements of the instructor pilot, frequently used during peak traffic times.

2.1.2 The crew of the KLM 59Z B737

The crew of flight KLM 59Z reported on the APRON frequency at 19:40 UTC. APRON cleared them, without further information, to proceed to parking area 10 via LINK 4.

They did not hear the radiotelephone exchanges between the Citation and Geneva APRON, as when these communications took place they were on the Control Tower frequency, 118.700 MHz. They therefore had no reason to doubt the pertinence of the clearance received.

2.1.3 Operational aspects concerning the apron

The usual route given to an aircraft vacating the runway at taxiway DELTA to proceed to parking stand 10 involves routing it via the OUTER taxiway by means of a slight 30° right turn and, after passing satellite 40, by means of a right-angle turn, LINK 3, which brings it directly to its parking stand, in front of the GIA main building.

However, allocation of this route is not always possible, in particular when traffic is moving on the OUTER taxiway.

2.1.4 Operational aspects concerning the apron controller

At the time of the incident, the APRON service was, as usual, being provided by a single, experienced apron controller.

The volume of traffic – according to his statements – was average. Between the moment when PJS 303 began to taxi up to the moment of the incident, the

controller was busy on the telephone with a handling agent; furthermore, he was in radio contact with a runway vehicle on the VG2 vehicle frequency.

According to his statements, he did not follow the Citation's progress on the SAMAX screen because, he said: *"I use Samax as an aid, not as a decision-making tool."*

At the time of the incident, light pollution around satellite 40, reinforced by the dazzling effect due to the rain, did not permit direct visual monitoring of taxing aircraft, particularly for aircraft the size of the Citation. Several aircraft were parked around satellite 40, and therefore masking part of the OUTER taxiway.

This is why, under the prevailing conditions, consultation of the SAMAX system would have been advisable and would probably have prevented the incident. It is noted that the duty instructions do not prescribe the use of the SAMAX system for the conditions prevailing at the time of the incident.

From the apron controller's workstation, the airport infrastructures obstruct, partially but permanently, the view of the location at which the incident occurred (see ANNEX 3 photos).

In his statement, the controller stated that he was aware of the separation to be achieved to ensure that the two aircraft crossed. He asked the B737 to use LINK 4 with the intention of quickly vacating the OUTER taxiway, which he knew to be occupied.

Since the controller had no visual reference, his mental representation of the existing situation did not correspond to the reality. He was probably mistaken about the actual position of the aircraft, which he should have placed further to the west.

2.2 Human factors

2.2.1 Crew of the Jet Aviation C550

The two pilots constituting this crew were commanders. This is the situation for an instruction flight. This aspect of the operation may have adversely affected situational awareness concerning the external environment and might explain why the two C550 pilots did not take notice of the radiotelephone exchange between Geneva APRON and the conflicting aircraft cleared to enter the tarmac. If either of the pilots had realised that this traffic would be in conflict, it is probable that a confirmation of priority would have been requested from Geneva APRON by one or the other.

The pilot in the left-hand seat had previously fulfilled the function of commander on the same aircraft type with his previous employer. He was carrying out this flight phase under supervision "*LIne Flying Under Supervision*" (*LIFUS*) in accordance with the European EU-OPS regulations. The special situation of this crew, notably on the ground, signifies a temporary increase in workload for its two members and a temporary reduction in cognitive capability, influencing their perception of the environment (situational awareness). This is true both for the trainee commander under supervision – he was having to familiarise himself with different elements of procedure or briefings – and for the instructor, for whom the right-hand seat is not the one he usually occupies and in which he is responsible for a copilot's tasks: checklists and radio communications, in addition to the supervisor's task. These factors may explain a reduction in vigilance in monitoring radio communications, such monitoring would have made it possible to hear that another aircraft was going to cross their route.

This "LIFUS" corresponds to the requirements of the aforesaid regulations and is described in the operator's operation manual. The latter specifies in particular a minimum number of sectors to be completed under supervision by any pilot who has changed operator. Since it is not a matter of conversion to a new type, this training may be limited to familiarisation and a few sectors, the number of the latter depending on factors such as the pilot's experience, difference in instrumentation or onboard equipment, type of operation, characteristics and difficulties of the network served by the new operator, for example; this list is not exhaustive.

The crew were returning from half a day's training on a neighbouring French aerodrome before completing this final sector of the day to Zurich airport. This type of flight, although not considered as an aptitude test in strict terms, does nevertheless have the character of an examination, since it is generally followed by a formal debriefing.

2.2.2 LOSA studies on "threat and error" management

The human factors research group of the University of Austin (Texas) made 4500 observation flights on the occasion of 25 LOSA – Line Operation Safety Audit. This study, conducted by Robert Helmreich, highlights the large proportion of threats and errors during the period of operation preceding take-off.

2.2.3 Crew of the KLM B737

As far as the late realisation of the conflicting traffic by the crew of aircraft KLM 59Z, it will be noted that the commander declared in his statement that the copilot, who was on his right and therefore on the side from which the conflicting traffic was coming, was carrying out tasks "head down" – once they had vacated the runway. These activities may include various manipulations – which may or may not be included in the checklist after landing – as well as administrative tasks such as entries in the flight report. Furthermore, the copilot usually handles radiotelephone exchanges with the control units. As for the commander, his external field of vision is normally restricted, particularly to the right of his position, because of the copilot's presence and the small size of the windscreens on this aircraft model.

3 Conclusions

3.1 Findings

- The taxi clearance from the TAG parking to the holding point for runway 23 issued by Geneva APRON to the crew of PJS 303 was not subject to any particular restrictions or conditions.
- The apron controller was in possession of an appropriate licence.
- The clearance to enter the apron given by Geneva APRON to the crew of KLM 59Z was not subject to any particular restrictions or conditions.
- The position of the Geneva APRON service does not allow unobstructed visibility over the intersection formed by the OUTER taxiway and the DELTA rapid exit.
- The sector of the OUTER taxiway located north of satellite 40 cannot be observed at night, given its strong lighting and in particular that of position 43.
- At the time of the incident, several aircraft were parked around satellite 40, masking part of the OUTER taxiway.
- The unfavourable meteorological conditions created a lighting reflection phenomenon due to the rain.
- The warning notes contained in the Swiss AIP LSGG AD 2.24.2-1 Aerodrome – ground movement chart – ICAO concerning vacating the runway at taxiways Delta and Echo mention: "traffic on the outer TWY can become conflicting with respect to traffic vacating RWY at DELTA". When in doubt, hold short of intersection and await instructions by GENEVA APRON."
- The warning notes published in Jeppesen JeppView 3.6.0.0 on page 10-9 concerning the same exits mention: "RWY incursion 'hot spots' DANGER potential conflict with traffic on Outer TWY."
- The Jet Aviation C550 was being taxied by the pilot seated on the left during this LIFUS (LIne Flying Under Supervision) sector.
- In the C550, the copilot function was being performed by a commander with a type rating instructor (TRI) qualification acting as "training captain" for this LIFUS sector.
- The navigation lights and other taxiing lights were in operation on both aircraft.

3.2 Causes

This serious incident is due to the fact that Geneva APRON gave a clearance for an aircraft to enter the apron, in front of another cleared traffic which was not subjected to appropriate surveillance.

The fact that the SAMAX detection tool was not consulted contributed to the serious incident.

4 Safety recommendation(s) and measures taken after the incident

4.1 Measures taken

The AIP and Jeppesen documentations have been updated with regard to the warning notes relating to vacating the runway via taxiways CHARLIE, DELTA and ECHO.

Payerne, 26 May 2009

Aircraft Accident Investigation Bureau

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Annexes

Annex 1: extract of SAMAX incident's replay : KLM with yellow label, PJS with blue lebel.



Annexe 2





Annex 3 : photos from the AMS Tower, on the 24th November 2008