



AAIS Case Reference: 12/2012

AIR ACCIDENT INVESTIGATION SECTOR

FINAL

AIR SERIOUS INCIDENT INVESTIGATION REPORT

TIRES' DAMAGE ON LANDING DUE TO PARKING BRAKES INFLIGHT ACTIVATION

IL-76TD
UP-I7625
Air Trast
Al Maktoum International Airport
Dubai, the United Arab Emirates
21 June 2012

General Civil Aviation Authority
of
The United Arab Emirates



United Arab Emirates



Air Accident Investigation Sector
General Civil Aviation Authority
The United Arab Emirates

OBJECTIVE

This Investigation is limited to the aspects related to the landing phase operations and the associated Aircraft design, performance and airworthiness issues.

This Investigation is performed pursuant to the UAE Federal Act No 20 of 1991, promulgating the Civil Aviation Law, Chapter VII, Aircraft Accidents, Article 48, and in compliance with the UAE Civil Aviation Regulations, Part VI, Chapter 3, and in conformity with Annex 13 to the Convention on International Civil Aviation and in adherence to the Air Accidents and Incidents Investigation Manual.

The sole objective of this Investigation is to prevent aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

AIRCRAFT SERIOUS INCIDENT BRIEF

GCAA AAIS Case No.:	12/2012
Operator:	Air Trast
Aircraft Type and Registration:	IL-76TD, UP-I7625
Number and Type of Engines:	Four D-30KP-2 Turbofan Engines
Date and Time (UTC):	20 June 2012, 0200 LT UAE (UTC +4)
Location:	Runway 30 of Al Maktoum International Airport (DWC).
Type of Flight:	Cargo Transport
Persons on Board:	Eight
Injuries:	None
Nature of Damage:	All 16 main landing gear tires damaged and deflated, no subsequent damage to the Aircraft had occurred.

The occurrence of the Ilyushin (IL)-76TD cargo Aircraft, registration mark UP-I7625, was notified to the General Civil Aviation Authority (GCAA) on 21 June 2012 at about 0205 LT UAE through the Duty Invigilator (DI) 24/7 hotline number +971 506414667.

Immediately after the notification, an Investigator from the Air Accident Investigation Sector (AAIS) launched to the occurrence site and started to collect the on-site data.

After the Initial/On-site Investigation phase, the occurrence was classified as a “Serious Incident” due to the severity of the consequences and the sensitive flight phase.

Next day, an Investigation Team was formed to investigate the case as a fulfillment to the obligation of the United Arab Emirates (UAE) as being the State of Occurrence.

The investigation into this Serious Incident is limited to the events leading to it; no in-depth analysis to irrelevant issues was made.

Notes:

¹ Whenever the following words are mentioned in this Report with first Capital letter, it shall mean the meaning opposite to each:

- (Aircraft)- the aircraft involved in this Serious Incident.
- (Airport)- Al Maktoum International Airport, UAE.
- (Investigation)- the investigation into this Serious Incident
- (Incident)- this investigated Serious Incident
- (Report)- this Serious Incident Final Report



- 2 Unless otherwise mentioned, all times in this Report are Coordinated Universal Time (UTC), (UAE Local Time minus 4).
- 3 In this Report, the word “Cockpit” and “Flight Deck” are synonyms.
- 4 Photos used in the text of this Report are taken from different sources and are adjusted from the original for the sole purpose to improve clarity of the Report. Modifications to images used in this Report are limited to cropping, magnification, file compression, or enhancement of color, brightness, contrast or addition of text boxes, arrows or lines.

ABBREVIATIONS AND DEFINITIONS USED IN THIS REPORT

AFM	Airplane Flight Manual
AFT	Aftward
AGL	Above Ground Level
AOC	Air Operator Certificate
ASDA	Accelerate-Stop Distance Available
ATS	Air Traffic Service
CoA	Certificate of Airworthiness
CoR	Certificate of Registration
CRM	Crew Resource Management
CVR	Cockpit Voice Recorder
FDR	Flight Data Recorder
fpm	Feet per minute (climb-descent speed measurement unit)
ft:	Feet (distance unit)
FWD	Forward
GCAA	General Civil Aviation Authority of the United Arab Emirates
Hr(s)	Hour(s) (time unit)
IAC	Interstate Aviation Committee
ICAO	The International Civil Aviation Organization
IFR	Instrument Flight Rules
Km	Kilometer (distance unit)
Km/hr	Kilometers per hour (speed unit)
kt	Knot(s) (airspeed unit)
LDA	Landing Distance Available
LH	Left hand
LG	Landing Gear
m	Meters(s)
m/s	Meters per second (speed unit)
MLG	Main Landing Gear
MSN	Manufacturer Serial Number
NLG	Nose Landing Gear
NM	Nautical Miles (distance unit)
No.	Number
P/N	Part Number
QAR	Quick Access Recorder
QNH	Barometric pressure adjusted to sea level
RH	Right Hand
RWY	Runway



s	Second(s)
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
UAE	The United Arab Emirates
UTC	Coordinated Universal Time
VFR	Visual Flight Rules

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SYNOPSIS

On 21 June 2012, and upon touchdown at Runway 30 of Al Maktoum International Airport, Dubai, UAE, the sixteen main landing gears tires of the Ilyushin (IL)-76TD, UP-I7625, flight number RTR 1016 operated by Air Trast, burst due skid caused by brakes jamming at landing.

The Investigation found that the parking brake was switched to ON at some time prior to landing.

The Aircraft blocked the runway for 19 hours until some of the wheels were replaced in order to enable the Aircraft to be towed to the maintenance stand.

The crew disembarked the Aircraft with no injuries.

The AAIS determined that the causes of the serious incident were:

- (a) Tires lock prior to touchdown;
- (b) Switching the parking brakes to ON in-flight and continuing to land with parking brakes engagement; and
- (c) The CRM was not sufficient to detect and prevent the parking brake switch commission error.

Contributing factors were:

- (a) The parking brake system was not sufficient to detect and/or prevent the in-flight engagement of the parking brake; and
- (b) The communication network among the flight deck crew was not sufficient.

Three safety recommendations were designed for the Operator's corrective actions, to:

SR 18/2013- Enhance the CRM training for the flight deck crew.

SR 19/2013- Enhance the English language proficiency for the flight deck crew to be up in conformance with the standards of Annex 1 to the Convention on International Civil Aviation.

SR 20/2013- Enhance the quality system to assure that efficient training and pilots' evaluation systems are maintained.

Two safety recommendations were designed for the Civil Aviation Committee of the Republic of Kazakhstan corrective actions, to:

SR 21/2013- Re-evaluate the Operator's CRM and enhance it to be in conformity with the published standards.

SR 22/2013- Re-evaluate the Operator's crew English proficiency and enhance it to be in conformity with the standards of Annex 1 to the Convention on International Civil Aviation.

One safety recommendation was designed for the Ilyushin Design Bureau corrective action, to:

SR 23/2013- Re-address the AFM procedures and checklists to add a check item to the "Before Turning on Base Leg or at a Distance of 10 to 11 Miles" checklist to read:

"Landing gear: Down, green annunciator glow, parking brake OFF, brakes lights OFF"

One safety recommendation was designed for the GCAA corrective action, to

SR 24/2013- Improve the Civil Aviation Regulations to contain provisions for more proactive approach to safety in regards to foreign operators.

1. FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

On 21 June 2012, during its approach to Al Maktoum International Airport¹ (OMDW), Dubai, UAE, coming from Kandahar International Airport (OAKN), Afghanistan; the captain of Ilyushin (IL)-76TD, UP-I7625, flight number RTR 1016 operated by Air Trast, called the flight crew at 20:30:42 UTC to prepare for the “Before Descent” checklist after approximately 2 hrs and 30 minutes from departure and approximately 30 minutes before arrival.

The flight crew completed the checklist normally at 20:31:18 and the QNH was changed to 998.

At 20:42:20, RTR 1016 called Dubai ATC informing passing 11,300 ft descending to 10,000 ft, the ATC instructed RTR 1016 to maintain 10,000 ft, check direct to Rivol waypoint in order to approach Runway (RWY) 30 of the DWC Airport, the crew read back the instructions correctly.

At 20:45:29, RTR 1016 informed the ATC passing 3,000 ft, ILS approach RWY 30 of DWC Airport.

At 20:45:36, the captain called for idle power for unknown reason, at 20:49:06 the navigator replied “*so, I think the idle power should be set*”, the captain answered “*set it, idle power*”.

At 20:53:49, the radio operator announced for clear to land RWY 30.

At 20:53:59, the captain called for extending the landing gears which was accomplished and read back by the flight engineer.

At 20:54:14 “*Check the Altitude*” automatic callout was heard, followed by “*two hundred seventy*” number callout by the captain. At that time, the distance was 11 km (5.94 mile), and the rate of descent was maintained at 5 to 6 m/s (985 to 1180 fpm).

At 20:54:25, the flaps were extended to position 43 while the speed was maintained at 230 km/hr (124 kts).

At 20:54:41, heading with the landing runway was established; the distance was 9 km (5.4 mile). at 20:55:11 the captain called for idle then for full throttle.

At 20:56:55, the navigator started to call out the AGL at 80 m, 70, 60. At “*altitude is 60*” callout, “*low flaps*” callout started and repeated for 8 times for 16 s during which RTR 1016 was in the final approach and the captain commanded to “*the lift flaps a little pit*”.

At 20:57:24, the Aircraft reached 1 m (3.28 ft) AGL, the captain commanded idle power, followed by “*half a meter*” callout by the navigator. The Aircraft touched down at 20:57:27.

Upon touchdown on RWY 30, the captain commanded the flight engineer to apply speed breaks and thrust reverse. Thirteen seconds later, the captain experienced left hand (LH) drift where he immediately commanded to turn the thrust reverse to “OFF”.

The Aircraft continued drifting for approximately 37 s during which the captain was trying to correct by using the brakes pedals.

¹ Known also as Dubai World Central (DWC) International Airport

While the Aircraft was slowing down, the captain and navigator were discussing the reason behind the drift, both attributed the drift to tire(s) burst without knowing its/their number or position.

Thereafter, the captain stopped the Aircraft completely at the taxiway. While he was generally checking the cockpit, he realized that the parking brake switch was positioned at “ON”, subsequently he directed a question to the rest of the flight crew of who did move the switch to “ON” without getting any answer. When the captain advanced throttles in order to resume taxiing to the stand, the Aircraft rejected to roll.

The exterior inspection revealed that the entire MLG 16 tires totally damaged and deflated due to skidding. The Aircraft blocked RWY 30 for approximately 19 hrs until some of the wheels were replaced in order to enable the Aircraft to be towed and vacate the runway.

The crew disembarked the Aircraft with no injuries.

1.2 INJURIES TO PERSONS

Table 1- Injuries to persons							
Injuries	Flight Crew	Cabin Crew	Other Crew Onboard	Passengers	Total Onboard	Others	
Fatal	0	0	0	0	0	0	
Serious	0	0	0	0	0	0	
Minor	0	0	0	0	0	0	
None	5	0	3	0	8	0	
TOTAL	5	0	3	0	8	0	

1.3 DAMAGE TO AIRCRAFT

The Aircraft was intact; no damage was noted except the entire MLG tires which damaged and deflated.

1.4 OTHER DAMAGE

None.

1.5 PERSONNEL INFORMATION

1.5.1 Crew Qualifications

The flight crew encompassed: the captain, co-pilot, flight engineer, radio operator and navigator.

Flight operator was also onboard the cargo cabin for cargo handling.

Two ground engineers: mechanic and avionics were onboard occupying two cabin attendant seats behind the flight deck.

Table 2 illustrates the qualifications of the flight crew.

Table 2- Flightcrew qualifications										
Crewmember	Age	Gender	License	Validity	Issuing State	Validating State	Medical certificate/ expiry	Ratings	English Language Proficiency /expiry	Last CRM training
Captain	59	Male	ATPL	2/11/2012	Ukraine	Kazakhstan	Class 1, 16/2/2014	IL-76/T/TD/MD	Level 4, 2/11/2012	24/11/2011
Co-pilot	44	Male	ATPL	23/3/2013	Ukraine	Kazakhstan	Class 1, 22/3/2014	IL-76/T/TD/MD	Level 4, 29/9/2013	25/2/2011
Flight engineer	57	Male	Flight Engineer	1/3/2013	Kazakhstan	--	Class 1, 1/3/2014	An-24, 26, 12, 30, 32, TU 154, IL 76.		--
Navigator	61	Male	Navigator	31/10/2012	Kyrgyz Republic	Kazakhstan	Class 1, 31/10/2012	IL 18, TU 154, IL 76	Level 4, 29/9/2013	--
Radio operator	49	Male	Radio Operator	16/9/2012	Ukraine	Kazakhstan	Class 1, 26/11/2013	An-24, 26, 12, 30, 32, TU 154, IL 76	Level 4, 25/4/2014	--

1.5.2 Duty Time

In the day of the Incident, the crew flew the Aircraft to operate flight No. RTR 1015 from DWC Airport to Herat Airport (OHR), Afghanistan. The departure was at approximately 1200 and the flight time was 3:10 hrs. The Aircraft then departed from Herat Airport to Kandahar for 1:05 hrs flight time. At 18:00, the Aircraft departed Kandahar to DWC Airport in 3:00 hrs flight time.

According to the “Crew Duty Time” document, the daily flight time was 7:15 and the Total Duty Time was 10:30 hrs.

1.6 AIRCRAFT INFORMATION

1.6.1 General

Type:	IL-76TD
MSN:	0033446350
Registration mark:	UP-I7625
State of Registration:	Republic of Kazakhstan
Date of CoR issue:	2 July 2010
CoA validity:	2 August 2012

According to the records provided to the Investigation, there was no reported significant defect on the Aircraft prior to the Incident.

1.6.2 IL-76TD Landing Gear and Brake System

The five-cycle aircraft landing gear consists of a steerable NLG and two pairs (front and rear) MLG with four wheels with brakes on each side.

The No. 1 hydraulic system is responsible for extension/retraction of the FWD pair of the MLG, emergency extension of the AFT pair of the MLG and emergency closing of its doors, full application of the brakes of the FWD pair of the MLG including the parking brakes and the braking of the wheels during LG retraction and for the NLG steering control.

The No. 2 hydraulic system is responsible for extension/retraction of the NLG and AFT pair of the MLG, emergency extension of the FWD pair of the MLG and emergency closing of its doors, full application of the brakes of the AFT pair of the MLG including parking brakes, braking the AFT pair of the MLG and NLG wheels during LG retractions and is also responsible for NLG steering control.

Extension/retraction of the NLG and MLG is performed simultaneously by depressing the retraction/extension button with the aid of hydraulic actuators. The NLG is retracted FWD, the MLG are retracted crosswise. All the LG units are locked in the “retracted” and “extended” positions by mechanical locks. The LG compartments are closed by the doors both with the LG extended and retracted. The locks of the LG and LG doors are released by releasing the hydraulic actuators.

IL-76TD has a provision for emergency closing of the MLG doors (after the LG normal extension/retraction and emergency extension) by means of EMERGENCY LG DOORS CLOSNG switch located on the pilot’s instrument panel.

Emergency extension of the LG may be performed by means of the LG emergency extension handles in the flight compartment frame No. 14.

During the LG emergency extension, the uplocks of all the LG and MLG compartment door are released by the LG emergency extension handle driving the mechanical linkage. The NLG compartment locks are released by the NLG itself during its extension. If the LGs are extended by free falling, the down lock position is accomplished by hydraulic actuators of the struts. These hydraulic actuators are usually powered by the other operative hydraulic system.

During the LG emergency extension, the MLG compartment doors are closed automatically by the hydraulic pressure.

After the LG emergency extension, the NLG compartment doors remain open.

The LG position is displayed by light indicators of the extreme positions (extended/retracted) and electrical indicators of the extreme and intermediate positions.

To prevent inadvertent retraction of the LG on the ground, provision is made for interlocking (switching OFF) the LG retraction system, with the shock struts statically compressed. When necessary, the interlocking system can be overridden by the GRND RELAY INTERLOCK OFF switch on the air condition system control panel.

If all the throttle levers are set below 0.5 to 0.6 maximum continuous power, with the flight altitude changing, or during landing approach with the flaps extended by more than 15°, the light and aural warning devices actuate (EXTEND LG) red annunciator illuminates, horn and voice message (EXTEND LANDING GEAR) are heard.

With the flaps retracted, the horn can be switched to OFF by the momentary switch installed on the flight compartment LH console. With the flaps extended by more than 15°, the horn is automatically switched to OFF only upon the LG extension.

To monitor the LG position from the ground, the NLG and FWD MLG are equipped with white external lights which illuminate when the LG is extended.

The NLG steering is remote-controlled either by the steering wheels or the rudder pedals of either the captain' or co-pilot's. When controlled by the steering wheels, the NLG is steerable within an angular range of $\pm 50^\circ$ (during towing and taxiing). When controlled by the pedals, the NLG is steerable within a range of $\pm 7^\circ$ (during takeoff roll and landing run).

The captain can steer the NLG regardless of the control mode: MAN, OFF, or PEDALS by operating the mode selector switch installed on the co-pilot's yoke.

The co-pilot can steer the NLG in the control mode selected by the captain if the aircraft control is transferred to him. The co-pilot can change the control mode by the mode selector switch only if the similar selector switch installed on the captain's control yoke is set to OFF.

The NLG steering angle is proportional to the steering wheel turning angle or the pedals displacement.

After setting the mode selector switch to MAN or PEDALS, the pressurized condition of the NLG steering system is displayed by amber caution annunciators installed on the pilot' instrument panel. With the wheel steering mode selected, advancement of all the throttle levers to the takeoff position causes the illumination of the red annunciator of SEL STEER TO PEDAL located on the pilots' instrument panel and aural call of "SHIFT NOSE GEAR WHEEL STEERING TO PEDALS". With the NLG steering ON, the CUT OFF NOSE LG PRESS red annunciator installed on the pilots' instrument panel comes on and the voice information system issues an audio call SWITCH OFF NOSE GEAR WHELL STEERING after liftoff. With RETRAC button depressed, the NLG steering system automatically selects the wheel steering mode at the initial moment of the LG retraction regardless of the three-position switch setting. This is to ensure steering of the NLG to the neutral position during retraction.

With the NLG steering control OFF, the system operates in the self-centering mode damping the NLG oscillations which occur during the aircraft rolling.

With the NLG uncompressed and the steering system is OFF, the wheels are automatically set to the neutral position or close to it by means of nitrogen-pressurized cams.

The MLG wheel brakes are controlled by the pedals mounted on the rudder pedals and operated from the captain's or co-pilot's station, respectively. The RH pedal is used to apply all RH MLG wheel brakes, while the LH pedal is used to apply all the LH MLG wheel brakes. The braking moment is proportional to the pedals displacement. Dual-signal anti-skid controls provided in the anti-skid system relieve the brake cylinder pressure in case of that the angular deceleration of the wheels exceeds the allowed level at the moment proceeding the skid condition as well as in case of the wheel rotational speed drops below allowed level. The pressure is relieved simultaneously in the brake cylinders of two wheels located symmetrically relative to the landing gear main pivot.

In case of brake system malfunction, a provision is made for fast release of all of the FWD or AFT MLG brakes wheels by the EMERG BRAKE RELEASE switch.

With the MLG shock struts uncompressed, the wheel brakes are released regardless the brake pedals setting. Parking brake is performed through a separate line from the brake hydraulic accumulator when the PARKING BRAKE switch is set to the appropriate position.

The NLG and MLG wheel brakes are applied automatically upon the LG retraction.

Brakes pressure level of each the LG brakes is indicated by a green light located on the pilots' instrument panel pressure gauges.

In paragraph 6.6.5, Book 2 of the Aircraft AFM, Section 6- *Operation of Aircraft Systems, Operation of MLG Wheel Brakes, E. Parking Braking*, it was stated that to switch the parking brake twin selector switches, the guard shall be opened, the setting to the applied position is done and then the switch to be covered by the guard. In order for the parking brake to be active, the brake hydraulic accumulator shall be pressurized between 180 to 225 kgf/cm² (2,560 to 3200 psi), the brake pressure gauge shall read 100±15 kgf/cm² (1,422±213 psi), the brake line pressurized condition green annunciates will illuminate.

To disengage the parking brake, the selector switch shall be put to OFF, consequently the brake pressure gauge will read 0 to 5 kgf/cm² (0 to 71 psi), the brake line pressurized condition green annunciator will extinguish, and then the brake system could be transferred to the pedals normally.

Appendix B to this Report depicts the general flight deck layout.

1.7 METEOROLOGICAL INFORMATION

Not a factor.

1.8 AIDS TO NAVIGATION

Not a factor.

1.9 COMMUNICATIONS

Not investigated.

1.10 AERODROME INFORMATION

Al Maktoum International Airport is a GCAA certificated aerodrome under Part IX of the UAE Civil Aviation Regulations- *Aerodromes Regulations*.

The Airport is located at Jebel Ali, 20 NM southwest of Dubai city, UAE. It is capable of IFR and VFR operations.

The category for firefighting is CAT 10. The capability for removal of disabled aircraft is lifting and hydraulic jacks capable for aircraft sizes up to and including Airbus 380.

The Airport has only one asphalt runway 12/30, 4,500 m long and 60 m wide. The slope of RWY 12 is +0.11% (first 1,762.5 m) and +0.5% (next 2737.5 m). The slope of RWY 30 is -0.5% (first 2,737.5 m) and -0.11% (next 1,762.5 m). The TORA, TODA, ASDA and LDA for both sides of the runway are 4,500 m.

The ATS communication facilities of the Airport are Approach, Tower, Ground and ATIS

1.11 FLIGHT RECORDERS

The Primary and Secondary FDR, CVR and QAR were removed from the Aircraft normally with no signs of damage.

The three cartridges of the FDR and CVR were removed and sent to the labs of the Interstate Aviation Committee (IAC) in Moscow, the Russian Federation. The testing and decoding were performed during the period from 11 to 12 July 2012.

The decoding was performed under one of the Investigation Team's supervision, the FDR and CVR revealed normal outputs whereas the QAR revealed poor recording quality.

1.11.1 Cockpit Voice Recorder

Type: MAPC
Model No: MARC-BM
S/N: 322029

1.11.2 Flight Data Recorders

Primary:

P/N: MLP-14-5
S/N: 90946

Secondary:

Type: K3-63
S/N: 30312

The Aircraft flight recorders did not contain any parameter relevant to the parking brake.

1.12 WRECKAGE AND IMPACT INFORMATION

The Aircraft was intact. Each side of the deflated tires left four continuous skid marks on the runway consistent with the tires lockage. The marks changed to wider and more intense at the ends after the tires completely deflated by the friction and wear caused by the skid. (Figure 1).



Figure 1- Skid marks at the runway

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

Not investigated.

1.14 FIRE

There was no sign of pre- or post- impact fire.

1.15 SURVIVAL ASPECTS

The crew disembarked the Aircraft normally.

1.16 TESTS AND RESEARCHES

None.

1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION

1.17.1. The Operator

The Operator was issued an AOC on 27 February 2012 by the Civil Aviation Committee of the Ministry of Transport & Communications, the Republic of Kazakhstan. His headquarter is in Astana City, Republic of Kazakhstan.

According to the AOC that expires on 27 February 2014, the Operator is authorized to operate flights as defined in the Operational Manual and in accordance with the published Regulation on the Civil Aircraft Certification and the AOC approved by the Decree of the Government of the Republic of Kazakhstan No. 1070 effective as of 18 October, 2010.

The oversight is the responsibility of the Civil Aviation Committee of the Ministry of Transport and Communication of the Republic of Kazakhstan.

1.18 ADDITIONAL INFORMATION

1.18.1 The Airplane Flight Manual (AFM)

In the Operator's AFM, Appendix 1- "Checklists", *the preparation of the aircraft for flight and the crew actions in flight should be carried out in compliance with the AFM.*

The crewmembers should inspect and test the aircraft and its equipment in compliance with the "Pre-flight Checklists" and report to the captain upon completion of the inspection and test.

According to the AFM, the "Before Takeoff" and "Before Landing" checklists shall be carried out in a *stage-by-stage* manner. The radio operator should read out the checklist and the crewmembers should be at their stations and report the "Accomplishment" of the checked item.

The "Accomplishment Report" should be clear, brief and without delay. The subsequent item should be read only after accomplishing the previous one.

According to the checklists, the crewmembers that should have responsibilities in performing the checklists are:

1. Captain;
2. Co-pilot;
3. Navigator;
4. Flight Engineer;
5. Radio Operator; and
6. Air Dropping System Operator (ADSO).²

The Checklists are categorised into the following phases:

- Before Takeoff.
- Prior Taxiing to Takeoff Position.
- In Taxiing.
- At Holding Point.
- At Line-up.
- Before Landing- Before Descent.
- After Setting Aerodrome Pressure.
- Before Turning on Base Leg or at a Distance of 10 to 11 Miles (18 to 20 Km).
- Before glide slope interception.

The checklists reflect numbers under each of the flight crew, the number ranges from 1 to 6 (the flight crew and the ADSO) as per the above crewmembers' sequence of order. Assignment the number to each check item under each of the crewmember depends on the role of that crewmember on "Accomplishment Report" and the "Reporting Sequence".

In the "Before turning on base leg or at a distance of 10 to 11 miles (18 to 20 km)" Checklist, under "Landing gear" check item, the flight engineer shall accomplish and report that the landing gear is down, the green annunciators glow and parking brake is OFF, the co-pilot shall confirm all the above accomplishments.

In addition to the "Before Turning on Base Leg or at a Distance of 10 to 11 Miles" checklist, the AFM contained items related to the parking brake in the "At Line-up" checklist.

The "At Line-up" checklist contained a "Readiness for takeoff" check operation which included the following "Accomplishment Reports" and "Reporting Sequence":

- "Ready", for the ADSO and radio operator reporting sequence;
- "Red signals dead, ready", for the flight engineer;
- "Heading.....ready", for the navigator;
- "Pitot tube on, ready", for the co-pilot; and

² According to the Aircraft AFM, Book 1, the ADSO main responsibilities are to open the entrance doors, make sure that no foreign objects are found in the cargo compartment, the cargo compartment is free of damage, the loading equipment and devices are proper, check his/her assigned instruments, check the secondary flight data recorder for tape continuity, open the cargo door, extend the tail gear and, if necessary, install the ramp extensions to the working position, supervise the various ground equipment moving in the vicinity of the aircraft, close the cargo door, entrance doors and retract the tail gear, report to the flight engineer that the serviceability of the cargo compartment equipment and report to the captain the readiness for engines' start.

- “Control surfaces unlocked, nose gear from pedals, **parking brake off**, ready”, for the captain.

In comparing the AFM checklists, especially the “Before landing” checklist, with the flight crew communications recorded by the CVR cockpit area microphone; the Investigation found that the “Accomplishment Report” and the “Reporting Sequence” were inconsistent with the requirements of the AFM at that phase of flight.

1.18.2 English Proficiency Check

The Kazakhstan Civil Aviation Regulations required that, from 5 March 2008, every pilot who has *IR or flies abroad* (with the exception of Slovakia) must demonstrate a certain level of aviation English knowledge on a scale comprising (0) to (6) *in compliance with ICAO*.

According to the Regulations, the validity of Level 4 English proficiency is from 3 to 6 years depending on the knowledge of the pilot. Level 5 has unlimited expiry and Level 6 is not required to pass the aviation English course.

The exam, 30 minutes long, is divided into three parts:

- Conversation;
- Listening: describing pictures after listening to two aviation related audio recordings, after that the student answers the questions; and
- Reading and translation of articles: articles from aviation magazines.

According to the system, the pilot license of the successful candidate will be endorsed with the English level under the item XIII in the license- *Comments*.

1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

None.

2. ANALYSIS

2.1 CREW RESOURCE MANAGEMENT AND COCKPIT ERGONOMICS

Since the Aircraft performed an uneventful takeoff from the departure airport, the Investigation believes that the parking brakes were set at the OFF position during the takeoff roll and that the “At Line-up” checklist which contained a parking brake OFF Accomplishment Report was not the source of the parking brake switching error.

According to the “Before Turning on Base Leg or at a Distance of 10 to 11 Miles” checklist, the landing gear check items were divided amongst the captain, the co-pilot and the flight engineer. The flight engineer is responsible for checking that the landing gear is down, the associated annunciator is green, and that the parking brake is OFF. The co-pilot is responsible for “confirming” all the above check items whereas the captain’s responsibility is limited to secondly reporting the nose gear at OFF position after the co-pilot’s first reporting sequence. (Figure 2).

Check operation	Accomplishment report	Reporting sequence					
		CAPT	C-P	N	FE	RO	ADS OPER.
	Before turning on base leg or at a distance of 10 to 11 miles (18 to 20 km)						
Landing gear	Down, green annunciators glow, parking brake OFF				①		
	Confirmed		②				
Nose gear control	OFF	②	①				
Radio altimeter selector	Selector set to ... feet (m)	3	2	1			
AFCS, HSI	APPROACH (SAXOQ) position Landing heading ... set	2	1				

Figure 2- Before Turning on Base Leg or at a Distance of 10 to 11 Miles

Reviewing the CVR transcript, the Investigation did not find any item related to parking brake Accomplishment Report, therefore the Investigation believes that the AFM requirement of that the radio operator reads out the checklist and the crewmembers accomplish and report was not fulfilled.

The parking brake Accomplishment Report is an interaction among the radio operator, the flight engineer and the co-pilot. The required action was to assure that the parking switch is at the OFF position. The radio operator function is to read the checklist, the flight engineer to check and the co-pilot to confirm.

According to the operational requirements, once the co-pilot confirms the parking brake OFF position, he shall immediately report nose gear control at OFF position which shall be confirmed by the captain. (Figure 2).

The IL-76TD cockpit contains seats for the captain, co-pilot, flight engineer and radio operator. The seats are configured for that the captain and co-pilot occupy the left and right seats, respectively, and facing forward. The flight engineer occupies a swivelling seat behind the co-pilot’s right seat, the seat is rotatable for a certain angle that enables the flight engineer to face the flight engineer panel or to face FWD for works on the central pedestal.

Although the location of the parking brake switch is close to the captain’s seat (red box in figure 3), the check item was assigned to the flight engineer and the co-pilot.

Furthermore, the Investigation believes that the probability of the error of confusion between the parking brake switch with other switches was not considerable since the switches located in the same vicinity were of different colour, type and protection. The nose landing gear switch (the other switch in the checklist, which was the responsibility of the co-pilot and the captain) was of a different type (swivel type switch, white box in

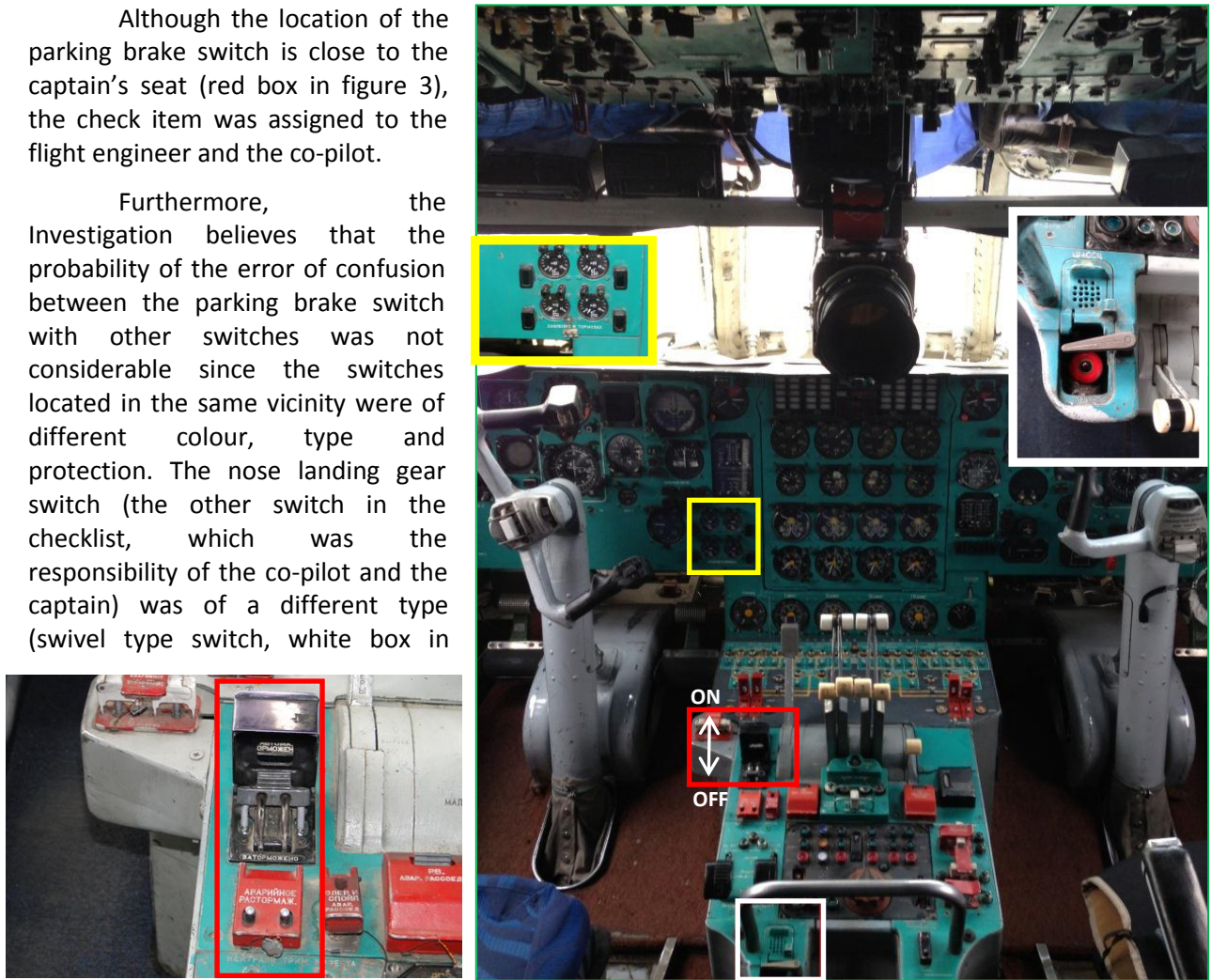


Figure 3- Central pedestal

figure 3) thus the probability of confusion error between the nose landing gear switch and the parking brake switch (toggle type switch) is minimum.

Although the Investigation could determine that the parking brake switch was set at the ON position before the landing, the Investigation could not determine when (the exact time during the flight) the switch was toggled, who toggled it, how and why it was toggled. However, the flap guard that covers the toggle lever switch would, to a certain extent, have prevented inadvertent movement of the switch.

In the aviation literature, “errors” are the result of actions that fail to generate the intended outcomes. They are categorized according to the cognitive processes involved towards the goal of the action and according to whether they are related to planning or execution of the activity. One of the error types is the “errors of commission” which occurs when a crewmember carryout a task incorrectly or do something that is not required.

The Investigation believes that the Aircraft cockpit ergonomic was not a contributing factor to the error of commission. Although the parking brake switch was suitably located and protected to prevent any inadvertent operation; neither the brakes lights (yellow box in figure 3) did adequately alert

the crew of the parking brakes engagement nor the parking brake system was immune enough to prevent the Murphy's Law³ in engaging the parking brake while the Aircraft was in the air-mode.

2.2 CREW COMMUNICATIONS AND CREW RESOURCE MANAGEMENT

According to the data provided to the Investigation, the Investigation could not determine the cause of the commission error, and who, among the flight crew, committed that mistake. However, the Investigation believes that the Crew Resource Management (CRM) was inadequate to detect neither to protect that error.

The backbone of adequate CRM is the intra-flight deck communication. In a review of historical aircraft accidents, it was found that errors are more likely to be the product of failures in communication and coordination than deficiencies in technical proficiency. The communication on the flight deck should be a two-way process: the sender who encodes the message and transmit it to the receiver who decodes it. The receiver should then become the sender and re-encode the message and transmit it once again back to the receiver who decodes it once more and checks that the meaning of what was sent was understood properly.⁴

Ruffell Smith's (1979) landmark full-mission simulator study showed that crew performance was more closely associated with the quality of crew communication than with the technical proficiency of individual pilots or increased physiological arousal as a result of higher environmental workload. No differences were found between the severity of the errors made by effective and ineffective crews, rather, it was the ability of the effective crews to communicate that kept their errors from snowballing into undesirable outcomes.⁵

According to the "Before Turning on Base Leg or at a Distance of 10 to 11 Miles" checklist, the radio operator is considered as a "message transmitter" in the landing gear check item, the flight engineer is the receiver who shall accomplish the parking brake check then transmit the message to the co-pilot who shall confirm and then transmit the message to the radio operator again.

The Investigation believes, it is most probably, that the intra-flight deck communication was not adequate to assure that a checklist item is clearly read, accomplished and confirmed.

2.3 ENGLISH PROFFECIENCY LEVEL

During the flight, the communication language amongst the multi-national and multi-lingual crew was Russian.

³ Murphy's Law states: "Anything that can go wrong, will go wrong"

⁴ Harris D. *Human Performance on the Flight Deck*. Ashgate Publishing Company. Burlington, the USA, 2011

⁵ Bryan J. Sexton and Robert L. Helmreich. *Using Language in the Cockpit: Relationships with Workload and Performance*. Department of Psychology, the University of Texas, Austin, Texas, the USA

Although the crewmembers possessed English Proficiency Level (EPL) 4, the majority of the crewmembers showed less English competency than the requirements of EPL 4 as set forth in paragraph 1.2.9.4 and Appendix 1 of Annex 1 to the Convention on International Civil Aviation.⁶

According to the AFM, the communication with the ATC is the responsibility of the radio operator whose mother language was Ukrainian. The radio operator was holding a license issued by the Ukrainian Civil Aviation Authority showing that he was at EPL 4.

The EPL 4 aviators shall be capable to understand, speak and write English during both normal and emergency situations. Under normal situations, less than EPL 4 aviators will also be able to understand standard terminologies transmitted by the ATC but when it comes to sophisticated emergency situations, the inadequate English proficiency will not enable them to communicate properly thus it is valid to expect that the transmitted and received messages are distracted.

⁶ Paragraph 1.2.9.4 of Annex 1 states: "As of 5 March 2008, aeroplane, airship, helicopter and powered-lift pilots, air traffic controllers and aeronautical station operators shall demonstrate the ability to speak and understand the language used for radiotelephony communications to the level specified in the language proficiency requirements in Appendix 1"

APPENDIX 1. REQUIREMENTS FOR PROFICIENCY IN LANGUAGES USED FOR RADIOTELEPHONY COMMUNICATIONS
(Chapter 1, Section 1.2.9, refers)

1. General

Note. — The ICAO language proficiency requirements include the holistic descriptors at Section 2 and the ICAO Operational Level (Level 4) of the ICAO Language Proficiency Rating Scale in Attachment A. The language proficiency requirements are applicable to the use of both phraseologies and plain language.

To meet the language proficiency requirements contained in Chapter 1, Section 1.2.9, an applicant for a license or a license holder shall demonstrate, in a manner acceptable to the Licensing Authority, compliance with the holistic descriptors at Section 2 and with the ICAO Operational Level (Level 4) of the ICAO Language Proficiency Rating Scale in Attachment A.

3. CONCLUSIONS

3.1 GENERAL

From the evidence available, the following findings, causes and contributing factors were made with respect to this Serious Incident, these shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this Investigation, the following sections are included in the “Conclusions” heading:

- **Findings-** statements of all significant conditions, events or circumstances in this Serious Incident. The findings are significant steps in this Serious Incident sequence but they are not always causal or indicate deficiencies.
- **Causes-** actions, omissions, events, conditions, or a combination thereof, which led to this Serious Incident.
- **Contributing factors-** actions, omissions, events, conditions, or a combination thereof, which, directly contributed to this Serious Incident and if eliminated or avoided, would have reduced the probability of this Serious Incident occurring or mitigated the severity of its consequences.

3.2 FINDINGS

- (a) The captain and co-pilot possessed licenses and certificates issued by Ukraine and validated by Kazakhstan as the Aircraft State of Registration.
- (b) The flight engineer possessed licenses and certificates issued by Kazakhstan.
- (c) The navigator and radio operator possessed licenses and certificates issued by Kyrgyz Republic and Ukraine, respectively, and validated by Kazakhstan as the Aircraft State of Registration.
- (d) The crewmembers were multinationals whose common flight deck communication language was Russian and the communication with the ATC was English.
- (e) During their interviews, the crewmembers did not show English language competency compatible to the ICAO English Proficiency Level 4.
- (f) There was no evidence of that the crewmembers were suffering from any tiredness or fatigue, or were under any psychoactive influence that might have adversely affected the crew performance during the flight.
- (g) The Aircraft was possessing the necessary registration and airworthiness documents issued by the Kazakhstan Civil Aviation Committee.
- (h) There was no evidence that the Aircraft had a significant defect was reported prior to the landing of the Aircraft.
- (i) The landing was a night, ILS.
- (j) The parking brake switch was moved to the ON position, in-flight, by one of the crewmember’s who could not be determined by the Investigation.

- (k) The CRM was not sufficient to detect and prevent the parking brake switch commission error.
- (l) The parking brake engagement could have been detected by the green brake pressure lights. Moreover, the switch position could have also informed the crew of the parking brake engagement or disengagement.
- (m) The parking brake system could not prevent the engagement while the Aircraft was in air-mode. According the Design philosophy, the parking brake was not designed to be switched ON while the Aircraft is in air-mode.

3.3 CAUSES

The Air Accident Investigation Sector determines that the causes of the RTR 1016 Serious Incident were:

- (a) Tires lock prior to touchdown;
- (b) Switching the parking brakes to ON in-flight and continuing to land with parking brakes engagement; and
- (c) The CRM was not sufficient to detect and prevent the parking brake switch commission error.

3.4 CONTRIBUTING FACTORS TO THE SERIOUS INCIDENT

Contributing factors to the Serious Incident were:

- (a) Although the parking brake system could have detected the inflight parking brake engagement through the green brake lights, the system was not designed to prevent the in-flight engagement of the parking brake.
- (b) The communication network among the flight deck crew was not sufficient.

4. SAFETY RECOMMENDATIONS

4.1 GENERAL

The “Safety Recommendations” listed in this Report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation⁷, and are based on the “Conclusions” listed in heading 3 of this Report, the GCAA expects that all safety issues identified by the Investigation are addressed by the receiving States and organizations.

4.2 FINAL REPORT SAFETY RECOMMENDATIONS

The Air Accident Investigation Sector recommends that:

4.2.1 The Operator to-

SR 18/2013

Enhance the CRM training for the flight deck crew.

SR 19/2013

Enhance the English language proficiency for the flight deck crew to be up in conformance with the standards of Annex 1 to the Convention on International Civil Aviation.

SR 20/2013

Enhance the quality system to assure that efficient training and pilots’ evaluation systems are maintained.

4.2.2 The Civil Aviation Committee of the Republic of Kazakhstan to-

SR 21/2013

Re-evaluate the Operator’s CRM and enhance it to be in conformity with the published standards.

SR 22/2013

Re-evaluate the Operator’s crew English proficiency and enhance it to be in conformity with the standards of Annex 1 to the Convention on International Civil Aviation.

4.2.3 The Ilyushin Design Bureau to-

SR 23/2013

⁷ Paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation states: “At any stage of the investigation of an accident or incident, the accident or incident investigation authority of the State conducting the investigation shall recommend in a dated transmittal correspondence to the appropriate authorities, including those in other States, any preventive action that it considers necessary to be taken promptly to enhance aviation safety”.



Re-address the AFM procedures and checklists to add a check item to the “Before Turning on Base Leg or at a Distance of 10 to 11 Miles” checklist to read:

“Landing gear: Down, green annunciator glow, parking brake OFF, brakes lights OFF”

NOTE- Refer to the comment received from the Interstate Aviation Committee on the Draft Final Report pertaining to this safety recommendation (Appendix D to this Report).

4.2.4 The General Civil Aviation Authority of the United Arab Emirates to- **SR 24/2013**

Improve the Civil Aviation Regulations to contain provisions for more proactive approach to safety in regards to foreign operators.

**Air Accident Investigation Sector
General Civil Aviation Authority
The United Arab Emirates**

APPENDIX A- "BEFORE LANDING" CHECKLISTS

11. 76 TD FLIGHT MANUAL

2. CHECKLIST

Check operation	Accomplishment report	Reporting sequence					
		GAPT	G-P	N	FE	RO	ADS OPER.
BEFORE TAKEOFF							
<u>Before starting engines</u>							
PM-65, PDR, recorder	ON, checked					1	
Identification	ON, checked	1					
Aircraft control	Control surfaces unlocked, ailerons and spoilers connected, six actuators and two dampers ON Locking GB open	1				2	
Trim tabs, trim actuators	Neutral. Green annunciators glow	2	1				
Doors	Closed, lamps dead					2	1
Tail gear	Retracted	3				2	1
Cargo compartment	Cargo and monorail motor hoists lashed						1
Plugs, nose gear pin	Removed				1		
Oxygen masks	Prepared, oxygen ON	6	5	4	3	2	1
<u>Prior to taxiing to takeoff position</u>							
Start control panel, APU	Closed, shut down, door closed				1		
Hydraulic systems	Pressure in 1 and 2 normal				1		
Air conditioning	ON				1		
Fuel system	... kg aboard. Pumps and automatic fuel management system on				1		
Electrical systems	Checked, function normally					1	
Compass system	ON, slaved	3	2	1			
Gyro horizons, HSI	Heading ... degrees, MH (COH) ON, marks aligned, indications correct	3	2	1			
Nose gear control	GYRO HOR power on, FROM ITT-125II (OT ITT-125II) annunciator glows MANUAL (PY4HOF), left, ON Both annunciators glow OFF	2				4	
			1				

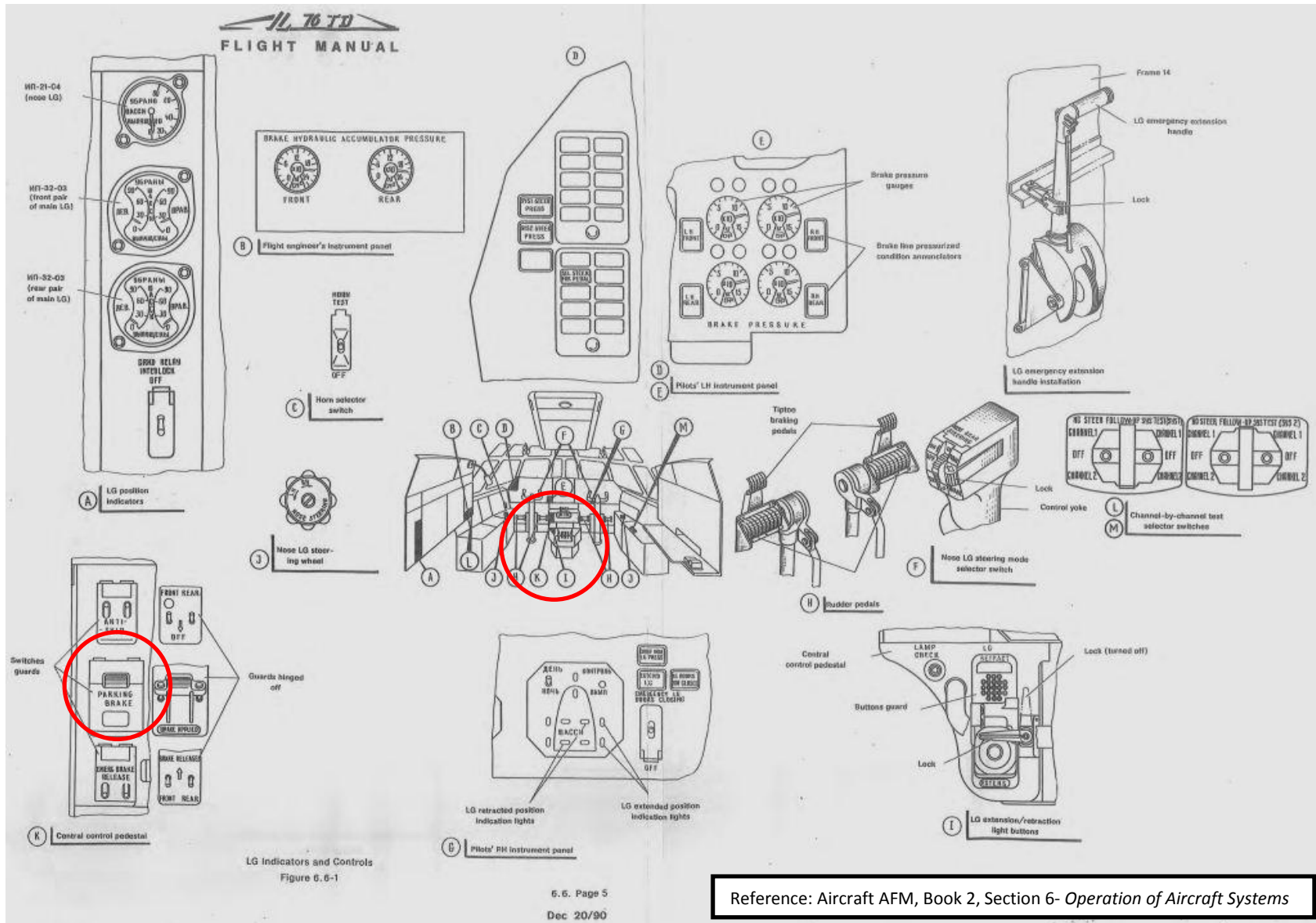
737-700
FLIGHT MANUAL

Check operation	Accomplishment report	Reporting sequence					
		GAPT	C-P	N	PE	RO	ADS OPER.
<u>In taxiing</u>							
Brakes	Checked, O.K.	2	1				
De-icers	Wing, tail unit - OFF, engines, ON (OFF), windows, LOW (CJABO)		1				
APCS	OFF	1					
ADF, SHORAN, KYPC-MII	ON, tuned. First to outer, second to KYPC-MII frequency of ... set			1			
Wing high-lift devices	Slats extended ...		2			1	
	Flaps extended ...					1	
	Spoilers and air brakes retracted Confirmed					1	
Direct vision windows	Closed. Marks aligned		2				
Takeoff data		2	1				
	Mass ... tons, centre-of-gravity position ... %, speeds V ₁ ..., V _R ..., V ₂ ... Stabilizer ... degrees, set		1				
<u>At holding point</u>							
Altimeters	Zero altitude, pressure ... mm Hg R ALT ON	3	2	1			
Gyro horizons	Checked, marks aligned	2	1				
Transponder	Mode selected	1					
Air bleed	OFF					1	
<u>At lineup</u>							
Readiness for takeoff	Ready						1
	Ready						
	Red signals dead, ready					2	
	Heading ..., ready				3		
	Pitot tube on, ready			4			
	Control surfaces unlocked, nose gear from pedals, parking brake off, ready		6	5			
<u>BEFORE LANDING</u>							
<u>Before descent</u>							
Chart	Reviewed	3	2	1			
Landing data	Fuel				1		

11, 76 TD
FLIGHT MANUAL

Check operation	Accomplishment report	Reporting sequence					
		CAPT	C-P	N	FE	RO	ADS OPER.
Radio altimeters	Gliding speed			1			
	Landing distance			1			
	Mass		1				
	Centre-of-gravity position		1				
Compass system	Right ON - ... set			2			
	Left ON - ... set	1					
KVPC-MI	MH (GCH) mode	3	2	1			
Hydraulic systems	ON, landing heading ...		1				
Stabilizer	Pressure normal				1		
	Left (right) control	1					
<u>After setting aerodrome pressure</u>							
Altimeters	Pressure ... set, altitude ... m	3	2	1			
	Indications identical				4		
ADF	Tuned. First-to outer, second-to inner			1			
Spoilers	Call signs listened to					2	
	Retracted				1		
<u>Before turning on base leg or at a distance of 10 to 11 miles (18 to 20 km)</u>							
Landing gear	Down, green annunciators glow, parking brake OFF				1		
	Confirmed		2				
Nose gear control	OFF	2	1				
Radio altimeter selector	Selector set to feet (m)	3	2	1			
AFCS, HSI	APPROACH (ЗАХОД) position Landing heading ... set	2	1				
<u>Before glide slope interception</u>							
Wing high-lift devices	Slats extended ...				1		
	Flaps extended ...				1		
	Confirmed		2				
Lights	Extended, ON				1		
Readiness for landing	Ready	6	5	4	3	2	1

APPENDIX B- GENERAL FLIGHT DECK LAYOUT



APPENDIX C- ICAO LANGUAGE PROFICIENCY RATING SCALE

LEVEL	PRONUNCIATION Assumes a dialect and/or accent intelligible to the aeronautical community.	STRUCTURE Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
Expert 6	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced, and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues and responds to them appropriately.
Extended 5	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation, rarely interfere with ease of understanding.	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	Able to speak at length with relative ease on familiar topics but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect and/or accent) or registers.	Responses are immediate, appropriate, and informative. Manages the speaker/listener relationship effectively.
Operational 4	Pronunciation, stress,	Basic grammatical	Vocabulary range and	Produces stretches of	Comprehension is	Responses are usually

	<p>rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.</p>	<p>structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.</p>	<p>accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.</p>	<p>language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.</p>	<p>mostly accurate on common, concrete, and work- related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.</p>	<p>immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.</p>
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APPENDIX D- COMMENTS RECEIVED FROM THE INTERSTATE AVIATION COMMITTEE PERTAINING TO SAFETY RECOMMENDATION SR 23/2013

IAC believes that this Recommendation should be deleted because in the AFM the relevant requirement it is already exist and it is also written in the Draft Report (see, item 1.18.1 from: *“In the “Before turning on base leg or at a distance of 10 to 11 miles (18 to 20 km)” Checklist, under “Landing gear” check item, the flight engineer shall accomplish and report that the landing gear is down, the green annunciators glow and parking brake is OFF, the co-pilot shall confirm all the above accomplishments... and further).*