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**NATIONAL
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SAFETY
COMMITTEE**

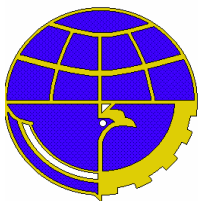
AIRCRAFT ACCIDENT REPORT

PT. TRIGANA

AN-72-100 ES-NOP

WAMENA AIRPORT, PAPUA

21 APRIL 2002



**NATIONAL TRANSPORTATION SAFETY COMMITTEE
DEPARTMENT OF COMMUNICATIONS
REPUBLIC OF INDONESIA
2004**

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This report has been prepared based upon the investigation carried out by the National Transportation Safety Committee in accordance with Annex 13 to the Convention on International Civil Aviation, UU No.15/1992 and PP No. 3/2001.

This report was produced by the National Transportation Safety Committee (NTSC), Gd. Karsa Lt.2 Departemen Perhubungan, Jalan Medan Merdeka Barat 8 JKT 10110 Indonesia.

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GLOSSARY OF ABBREVIATIONS

AD	Airworthiness Directives
AGL	Above Ground Level
AMSL	Above Mean Sea Level
AOC	Air Operator's Certificate
ATC	Air Traffic Control
ATPL	Air Transport Pilot License
CPL	Commercial Pilot License
CSN	Cycles Since New
CVR	Cockpit Voice Recorder
DGAC	Directorate General of Air Communications
DME	Distance Measuring Equipment
F/O	First Officer
FDR	Flight Data Recorder
hrs	Indicates time (hour)
IFR	Instrument Flight Rules
IIC	Investigator-in-Charge
ILS	Instrument Landing System
kg	kilogram(s)
km	kilometer(s)
kts	knots (nm/hr)
LT	Local time
mm	millimeter(s)
MTOW	Maximum-Take-Off-Weight
nm	nautical mile(s)
NTSC	National Transportation Safety Committee
°C	degrees Celsius
PIC	Pilot-in-Command
QFE	Height above airport elevation (or runway threshold) based on local station pressure
QNH	Altitude above mean sea level based on local station pressure
RPM	Revolutions per minute
S/N	Serial number
TS/RA	Thunder Storm and Rain
TSN	Time Since New
TT/TD	Ambient Temperature / Dew Point
UTC	Universal Time-Coordinated
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

SYNOPSIS

At 23:40 UTC on Sunday, April 21, 2002, the ES-NOP departed Sentani Airport, Jayapura, bound for Wamena. The aircraft, an Antonov AN72, was operated by PT Trigana Air Services as a cargo carrying charter flight. The flight crews of four include three cockpit crew personnel and a LoadMaster.

The flight was the third flight of eight flights planned for the day between Sentani Airport and Wamena airport. The first flight departed Sentani airport at 21:05 UTC / 06:05 LT. arriving at Wamena at 21:40 UTC/06.40 LT. The return flight from Wamena bound for Sentani, departing Wamena at 22:22 UTC/07.22 LT arrived at Sentani at 22:52 UTC/07.52 LT. The flights were reported normal, and the weather along the route was reported clear.

The third return flight, from Sentani to Wamena, departed Sentani at 23:40 UTC/08.40 LT carrying a load of 7,481 kg. The weather at Jayapura and along the route was clear.

On this last flight, the flight crew made a visual 'S' pattern approach on final to the airport.

Arriving Wamena at 09:13 LT /24:13 UTC, the touchdown on Runway 15 was in the touchdown zone, and bounced twice. The second bounce was reported to be more severe than the first one, and after the second bounce, the cockpit crew felt an unusual nosedown attitude of the airplane.

The airplane decelerated with smoke emitting from the forward cargo compartment. After the aircraft stopped, the PIC opened the left cockpit window and assisted the loadmaster to extinguish the fire, while the crew evacuated the aircraft. The aircraft and its cargo were severely damaged by the fire. There were no injuries reported on this accident.

The investigation team consists of personnel from NTSC, assisted by accredited representative from Interstate Aviation Committee. Technical help was provided by Antonov Design Biro, Enimex, and Estonian DGAC.

1 FACTUAL INFORMATIONS

1.1 History of Flight

At **23:40 UTC / 08:40 LT (WIT)** on Sunday April 21, 2002, the ES-NOP departed Sentani Airport, Jayapura, bound for Wamena. The aircraft, an Antonov AN72, was being operated by PT Trigana Air Services as a cargo carrying charter transport flight. The flight crews of four included three cockpit crew personnel and a loadmaster.

The flight was the third flight of eight flights planned for the day between Sentani Airport and Wamena airport. The first flight departed Sentani airport at **21:05 UTC / 06:05 LT**. Arriving at Wamena at **21:40 UTC / 06:40 LT**. The return flight from Wamena bound for Sentani, departing Wamena at **22:22 UTC / 07:22 LT** arrived at Sentani at **22:52 UTC / 07:52 LT**. The flights were reported normal, and the weather along the route was reported clear.

The third return flight, from Sentani to Wamena departed Sentani at **23:40 UTC / 08:40 LT** carrying a load of 7,481 kg. The weather at Jayapura and along the route was clear.

The cruise altitude during the flight was 16,000 ft. After waypoint 'Maleo' the airplane over-flew the so called 'north-gap' and the descent was initiated while passing the 'pass valley'. Three other airplanes were reported to be in the area, one Fokker F27 PK-YPQ which was enroute from Wamena airport to Jayapura, and two Antonov A26 aircraft, registration ER-AFQ and ER-AFE.

Flying over 'Yiwika' 7 Nm from Wamena airport, and descending through 12,000 ft with speed of 330 km/hr, the ES-NOP overtook the ER-AFE. The flight crew had the runway in sight. The PIC acting as pilot flying, flew an 'S' approach pattern during the final flight path of Wamena airport. (arriving Wamena 24:15 UTC / 09:15 LT)

On final and at an altitude of 100 meters, the airplane was lined up to the runway 15-center line. The airplane touched down while still within the touch down zone. The airplane bounced twice, the second and last bounce reported to be more severe than the first one. The airplane rolled down the runway, with the flight crew noticing an unusual nosedown attitude. The PIC/Pilot Flying applied reverse power and brakes, controlling the aircraft by using rudder inputs. During the roll, the loadmaster, sitting behind the PIC's seat saw black smoke coming from the floor of the forward side of the cargo compartment. The crew reported that the smoke hurt their eyes.

The airplane decelerated with smoke emitted from the forward cargo compartment. After stopping, the loadmaster opened the airplane door taking the extinguisher to extinguish the fire. The PIC shut down the engines after the airplane came to a standstill then opened the left cockpit window. PIC then left the cockpit assisting the loadmaster extinguishing the fire, the F/O completed the shutdown procedure, as the smoke blocked out his vision. The Flight Engineer attempted unsuccessfully opened the overhead emergency exit. The F/O and Flight Engineer then evacuated through the left cockpit window, while the PIC and loadmaster exited through the door.

Observing the occurrence, and as the crash bell was unserviceable, the ATC on duty called the Deputy Chief of the airport, and alerted the fire fighting brigade. The fire fighting personnel failed to start the fire truck, and after recharging the truck's battery for about 10 minutes reattempt to start for a second time. This attempt again failed, and the battery was again recharged, while fire fighting personnel ran the airplane's final position carrying portable fire extinguisher. After another ten minutes of battery charging, the fire fighting truck was finally started, immediately proceeding to the accident site. After a refill of the fire-extinguishing agent the fire was finally extinguished. Firefighting personnel extinguished the fire in about 30 minutes time.

The airplane was seriously damaged, with the front side of the airplane completely burnt out, the fire cutting a hole from behind the cockpit roof until approximately the middle

of the cabin in front of the roof. The cargo was totally consumed by fire. No one was injured during the accident

After the occurrence, Wamena airport was closed for Fokker 27 or bigger aircraft but opened for DHC-6 (Twin Otter) or smaller aircraft. The NTSC investigator team embarked to Wamena on that day (Sunday, April 21 2002)

On Monday, April 22 2002, at 02.00 PM (LT), the investigator team give the clearance to remove the aircraft from the runway, at 05.00 PM (LT) the airport authority personnel started the efforts to removed the aircraft by **big back hoe**, at 08.30 PM (LT) ES-NOP has cleared from runway. On Tuesday April 23rd 2002, the Wamena airport activities back to normal as usual.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others	TOTAL
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/ None	4	-	-	4
TOTAL	4	-	-	4

The crew consists of four persons, which is Pilot in Command, FO, one Flight Engineer and a Load Master. There was no other passenger in the aircraft.

1.3 Damage to Aircraft

The aircraft was found in nose down position, indicating the nose wheel has collapsed. The collapsed nose landing gear was found detached from the airframe, when the aircraft lifted to be moved. Cockpit and front end of airframe (in front of the wing) was found completely burnt. The fronts of both engine cowlings were also burnt. The front tire of right main landing gear was blown because of the fire and also the rear tire of left main landing gear.

1.4 Other Damage

The aircraft scraping the runway surfaces and damaging the asphalt. Close to the scraping marks, there are parallel skidmarks and rubber deposits on the runway surface.

1.5 Personnel Information

1.5.1 Cockpit Crew

1.5.1.1 Pilot-in-Command

Gender : Male
Date of birth : June 25, 1960
Nationality : Lithuanian
Marital status : Married
Date of joining company :
License : ES-0501

Validity period of license : 05 June 2002
Type rating : AN-72/74
Instrument rating : 12-03-1979
Medical certificate : Class I
Date of last medical : December 05, 2001
Last line check : 30-06-2001
Last proficiency check : 30-06-2001

FLIGHT TIME

Total time : 7744
This make & model : 800
Last 90 Days : 140.57
Last 72 Hours : 100.10
Last 24 Hours : 5.36'
This flight : Block 00:40 ; Instrument 35

Pilot-in-Command flew chartered flights in Indonesia since February 2002. The airplane and flight crew was wet leased by PT Trigana Air Services from ENIMEX LTD company. The airplane is owned by the ENIMEX LTD Company, and registered in Estonia.

Before flying An-72, the PIC was flying An-42, a kind of passenger aircraft. His first training on An-72 was on 12/13 September 2001 in Tallin Estonia.

The Captain normally flies with other set crew. This was the first flight of him to fly the F.O and engineer. He had a day off the day before the accident. He went to swimming at the hotel in the afternoon and slept at 21.00 LT.

1.5.1.2 First Officer

Gender : Male
Date of birth : August 07, 1959
Nationality : Estonian
Marital status : Married
Date of joining company : February 02, 2002
License : ES-0303
Validity period of license : June 12, 2002
Type rating : AN 72 / 74 IR
Instrument rating : 06-04-1988 (ATPL)
Medical certificate : Class I
Date of last medical : December 12, 2001
Last line check : 17-11-2001
Last proficiency check : 17-11-2001

FLIGHT TIME

Total time : 8500
This make & model : 100
Last 90 Days : 115.37
Last 24 Hours : 02.00
This flight : Block 00.40

F/O flew chartered flights in Indonesia since February 27, 2002.

All set crew consist of F/O, Engineer and load master with other Captain, active as crewmember the day before the accident. The first flight started at 06.00 LT and finished at 16.00 LT. After flight all crew went back to hotel and no special activities was made. They went to bed at 21.00 LT.

1.5.2 Flight Engineer and Load Master

	Flight Engineer 1	Load Master
Gender	: Male	Male
Date of birth	: 27.09.1957	-
Nationality	: Russian	Undefined
Marital status	: Married	
License	: ES-0347 (F/E)	0377 /ENX-0004
Validity period of license	: 15.07.2002	27.02.2003
Type rating	: An-72/74	An-28/2/72/74
Medical certificate	: Class I	Class I
Date of last medical	: 15.01.2002	19.02.2002

FLIGHT TIME

Total time : 10.000 hours

1.6 Aircraft Information

1.6.1 Aircraft Data

Registration Mark : ES-NOP
Manufacturer : KHARKOV AVIATION PRODUCTION
Country of Manufacturer : Russia
Type/ Model : An-72 / Transport/Cargo
Serial Number : 36572010905
Date of manufacture : (1st time used) October 30, 1985
Certificate of airworthiness : CAA 1812
Issued : July 25th, 2001 valid until 21-02-2003

Certificate of registration : CAA 1812
Issued : July 25th, 2001
Category : Cargo
Time Since New : 1897 hr
Cycles Since New : 1376 hr
Last Major Inspection : 1500 hr inspection in 1994 repeated in 2001

1.6.2 Engine Data

Engine Type : Lotarev ZKMB D-36
Type/ Model : D-36
Serial Number #1 : 708036181A034
 ▪ **TSN** : 1581.04 hr
Serial Number #2 : 708036101A077
 ▪ **TSN** : 1635.01 hr

1.6.3 Weight and Balance

The cargo manifest noted that the aircraft was carrying a cargo of rice from DOLOG (Logistics Office) in sacs, with a total weight of 6,600 kg. There were also several unspecified goods in crates with a total weight of 881 kg. The total weight of the cargo is 7,481 kg.

No	Customer / Retailer	Kind Of Goods	Weight (Kg)
1	DOLOG	Rice	6600 Kg
2	Cash retailer	Mixed	881 Kg
3	Passenger	-	-
Total			7481 Kg

Load sheet and Load message:

Basic weight	19.627	Maximum weight	27500	Max TOW	33500
Correction	373	Take-off fuel	+ 4700		
Dry Operating Weight	20.000	Allowed TOW	32200	Max Landing Weight	33000
Take-Off Fuel	+ 4700	Operating Weight	- 24700	Trip Fuel	+ 1200
Operating Weight	24.700	Allowed Traffic Load	7500	TOW	34200

Total traffic Load	7481	Allowed traffic Load	7500
Dry Operating Weight	+ 20000	Total Traffic Load	- 7481
Max Zero Fuel weight	27481	Underload before LMC (Last Minutes Change)	19
Take Off Fuel	+ 4700		
TOW	32181		
Trip Fuel	- 1200		
Landing Weight	30981		

1.7 Meteorological Information

WAJW aerodrome (Wamena)

Wind : Calm
Visibility : 10 km
Weather : NIL
Cloud : 3/8 CU
Base : 300 m
TT/TD : 20 ° C / 16 ° C
QNH : 1009.9
QFE : 836.8
Time : 00.00 UTC

* Meteorological Observation at 21-4-2002

1.8 Aids to Navigation

Airport only has NDB.

1.9 Communications

Time		Transcript
23.54	PK-YPL ATC	Wamena YPL request line up YPL Line up Runway 15 call ready
23.59	PK-YPQ ATC	Wamena YPQ bound for Mulia level 105 request start YPQ Cleared to start QNH 1009 temperature 19 call ready
00.00	PK-YPL	YPL Ready

	ATC	YPL Cleared for take-off
00.02	ATC	YPL Airborne time 00.01 call established Jayapura info
00.03	PK-YPL	Passing 9000 climb to level 110,3 miles Yiwika established Contact Jayapura Info
	ATC	YPL contact Jayapura info see you return
00.05	PK-YPQ	YPQ request taxi
	ATC	YPQ taxi line up 15 call ready
00.06	PK-YPL	YPL maintain position Yiwika
	ER-AFQ	AFQ maintain 120
	PK-YPL	Roger YPL copy continue
00.07	ES-NOP	Wamena tower ES NOP
	ATC	ES NOP go ahead
	ES-NOP	ES NOP position pass valley leave 130 for 120
	ATC	ES NOP cleared to final Runway 15, wind calm, QNH 1009, temperature 21. Observe traffic YPL maintain 110 position Yiwika.
00.08	ER-AFQ	Wamena ER AFQ
	ATC	ER AFQ go ahead
	ER-AFQ	AFQ position 5 miles Yiwika, leaving 120 descend to 9500, continue approach final 15, estimate Wamena 13.
	ATC	AFQ wind calm QNH 1009 Temperature 21 Runway 15
00.09	ATC	Position Yiwika leaving 120 continue approach final 15
	ES-NOP	Roger ES NOP continue approach Runway 15 report final
	ER-AFQ	AFQ position Yiwika 9500 continue approach final 15
	ATC	AFQ observe NOP, continue approach report final
00.10	PK-YPQ	YPQ request airborne time
	ATC	YPQ airborne time 00.09 report established Jayapura info
00.11	ES-NOP	ES NOP on final
	ATC	NOP cleared to land
00.12	ER-AFQ	AFQ on long final
	ER-AFE	AFE 8 miles Yiwika leaving 120 to 9500
	ATC	AFE QNH 1009 temperature 21 Runway 15
00.13	PK-YPQ	Wamena YPQ established Jayapura info ETA 00.29

1.10 Aerodrome Information

Airport Name	: Wamena Airport
Airport Identification	: WAJW
Airport Operator	: UPT (DGAC)
Location	: S04 05.9 E138 57.1
Elevation	: 5084'
Runway Direction	: 154 and 334
Runway Length	: 1650 m
Runway Width	: 30 m
Surface Condition	: Asphalt concrete
Category	: Class 2 (two)
Fire Brigade Category	: Category IV (four)

Wamena Airport is situated at the Baliem Valley, Jaya Wijaya Mountain with airport elevation 5085 ft and surrounded by mountains up to 12.000 ft high. The only navigation aid available is NDB "ZW" on frequency 222 Khz. The instrument approach procedure is not available for this aerodrome. This aerodrome is VFR operation only.

There are three "ways" normally uses to get to the aerodrome. The most common and direct from Sentani is via "North Gap". This route is via a valley (Pass Valley) with ground elevation \pm 8.000 ft. The others are called "Middle Gap" and "Bokondini Gap". These two "ways" have higher ground elevation.

The runway is asphalt concrete, 1.650 m long with runway azimuth 15 and 33. There are three aprons, military, civil and new (civil) apron.

1.11 Flight Recorders

1.11.1 Flight Data Recorder

The recorder, type TESTER U3 version 2 with S/N 2T-3M, contains 57 analog channels and 81 binary channels. The outer casing slightly damaged from fire and covered with carbon residue from the smoke.

1.11.2 Cockpit Voice Recorder

The recorder, type P503 BS, contains Mo-Steel wire recorder, which have one channel. A good recorder of the type may record up to 11 hours.

1.12 Wreckage and Impact Information

Skid marks and rubber deposits were found on the runway surface, from approximately 350 meters from the threshold of Runway 15 up to the final position of the aircraft on the runway, a distance of approximately 1100 meters. Two parallel lines / skid marks were observed, about 195 centimeters apart, with a black rubber tire mark in between. The nose wheel bay door and some small pieces of metal and rubber were found at about 100 meters from the initial end of the skid marks.

The airframes behind the cockpit to the front of wing were melted. It is probable that the fuselage frame was made of Magnesium alloy, so that it is easily consumed by fire.

When the wreckage lifted to be moved out of stop way, the nose wheel assembly was completely separated from the main wreckage (frame) and fell down. Its position was underneath the main wreckage. Close inspection to the landing gear reveals that the landing gear was detached from its fuselage frame attachment. The fracture surfaces on landing gear-fuselage frame attachment were consumed by fire so that the nature of the fracture can not be determined. Front joint of the landing gear and its shim damper was cut by friction force when the aircraft front belly skidded on the runway. All the hydraulic linkages to the landing gear were fractured. It is found that the landing gear actuating rod was fractured due to static overload.

1.13 Medical and Pathological Information

Not relevant

1.14 Fire

The fire broke out during the landing roll after the second bounce and collapse of the nose landing gear. Apparently, the heat resulting from friction between metal parts and runway pavement caught the hydraulic fluid and causes the fire. The flight crew reported that the fire apparently started from the front end of the airplane, consuming the cockpit and finally damaging the engines. Observing the occurrence, and as the crash bell was unserviceable, the ATC on duty called the Deputy Chief of the airport, and alerted the fire fighting brigade.

The fire fighting personnel failed to start the fire truck, and after recharging the truck's battery for about 10 minutes reattempt to re start for a second time. This attempt again failed, and the battery was again recharged, while fire fighting personnel ran the airplanes final position carrying fire extinguisher bottles. After another twenty minutes of battery charging, the fire fighting truck was finally started, immediately proceeding to the accident site. The foam tender arrived at the airplane final position approximately 30 minutes after alerted by the ATC. The foam tender run out of the fire extinguishing agent, and after a refill of the fire extinguishing agent the fire was finally extinguished, approximately 65 minutes after arrival of the foam tender at the site.

The fire fighting crews consist of 8 members. The first aid capability was limited to one box of first aid equipment. The fire fighting efforts used chemical fire extinguishing foam and powder for thirty minutes, depleting the chemicals. After refilling the efforts continue as other fires started to burn. A second refill was necessary, and finally the fire fighting personnel covered the smoldering airframe with foam to extinguish the fire. The fire tender remained at the site for another 60 minutes.

On that day, the duty person only consists of four people, there were 2 Junior training officer and two basic Training officer. The last routine training was committed at 1994. According to the regulation they have to do the training twice a year consist of dry training (fire rescue preparation training) and wet training (fire rescue simulation training)

The total fire fighting time was 65 minutes after the accident, and was officially declared finished at about 14:35 LT.

After the occurrence, Wamena airport was closed for Fokker 27 or bigger aircraft but opened for DHC-6 (Twin Otter) or smaller aircraft. The NTSC investigator team embarked to Wamena on that day (Sunday, April 21 2002)

On Monday, April 22 2002, at 02.00 PM (LT), the investigator team give the clearance to remove the damaged aircraft from the runway, at 05.00 PM (LT). The airport authority personnel started the efforts to remove the aircraft by **big backhoe**, at 08.30 PM

(LT) ES-NOP has cleared from runway. On Tuesday April 23 2002, the Wamena airport activities back to normal as usual.

The Fire Fighting Facilities:

Equipment		Year of Manufacture	Manufacturer
Foam Tender Type III	1 (one)	1978	Morita
RIV CA III 2400/550/250	1 (one)	1995	Rosenbaur
RIV Type IV	1 (one)	1982	Morita
Ambulance	1 (one)	1992	Mitsubishi

Chemical fire extinguishing agents available

Extinguishing Agent	Capacity	Action	Time to spray	Extinguishing sequence
Dry powder	200 kg	Spray	50 minutes	Simultaneously
Foam	600 liters	Solid	50 minutes	Simultaneously
Portable extinguisher	6 bottles	Spray	20 minutes	One by one
Water	660 liters	Solid	50 minutes	One by one

Category IV and V Airport firefighting personnel requirement:

- 1 Unit Crash car : 2 person
- 1 RIV-CA : 3 person
- 1 Ambulance : 2 person
- 1 Nurse Tender : 2 person
- 1 Command Car : 1 person

The total personnel requirement: $10 \times 1,35 = 14$ person

Wamena airport equipment and fire fighting personnel capability;

- Operational vehicle : Rosenbouwer
- Crew : 8 person
- First Aid Kit : 1 box

There were no rescue efforts, as all persons on board (cockpit crew and engineers, totaling 5 persons) exited the airplane without serious difficulties and or injuries

It was reported that no emergency announcement was communicated by the cockpit crew before the landing.

Crash bell at the fire station was malfunction, only one operational fire brigade vehicle that could be operated but it always stuck because the Accumulator could not be recharged and broken.

The fire extinguishing process was difficult because there were also so many people around the burnt aircraft try to help the fireman, which is block the way to firefighting personnel to extinguish the fire.

1.15 Survival Aspects

There is no flight crew injured by the accident. All crew are safely evacuated. They escaped from the burnt aircraft without any injured and after they failed in effort to extinguish the fire in their aircraft.

1.16 Test and Research

Tests and research conducted are:

1.16.1 Interview with the flight crew (Captain, F/O, F/E)

The highlights from the PIC interview are:

- The PIC flew the aircraft on the accident flight. He felt that the flight is normal until the landing. He recalled that the weather was clear and he could see the runway from Yiwika.
- He PIC recalled that the speed during the descent was 340 to 365 for 45 seconds then at 340-345 limit. The PIC recall that he started to use the flap (the 3^d position) after the aircraft descent, which was the over Yiwika. He believed that the distance between the runway and Yiwika is 10 mile, and his altitude over Yiwika was higher than usual (above the glide) because of the traffic, in which he overtook other aircraft.
- The PIC recalled that he made the final from the right of the direction of one sixty. He believed that he overshoot the final track slightly. When he was at the center line it was about 1 mile before touch point.
- The PIC recalled that he flared at height 4-6 m. He considered that bouncing while landing is normal if the aircraft is light. He experienced bouncing before but the aircraft handling was fine afterward.
- The PIC recalled to use the speed brake during descent and extend them full after fully touch down.
- Last the proficiency check was in January 2002, when he flew in Holland and Norway.
- In Indonesia, the checking flight that he had was by Trigana pilot. The government representative only checks their documents. The route training he had was done by Trigana and Enimex chief pilot.

The highlights from the F/O interview are

- The familiarization training he had was given by Trigana captain. He did not recall of getting any examination from government authority before he fly. In other countries that he flew he used to get an exam from local authority.
- He recalled the engines were still ON when fire initiated. The F/E shut the engines after the Load Master announced that he saw fire. He noted that during landing, the F/E was the one operating the landing gear.
- Aware of fire, he called the tower but there was no reply. Soon after that the electronic equipment went OFF.
- His last proficiency check was about 4 months ago in Germany.

- He mentioned that bouncing could happen sometimes in hard landing or if there is cross wind. The flight manual of Enimex state what to do in bouncing, which is holding strong on the column position. He, however, did not recall what the captain did as the aircraft bounce.
- He mentioned that all the pilots have training similar to CRM (cockpit resource management), which were repeated every three months.
- He recalled of trying to use the radio in the cabin but soon can not see anything because of the smoke. He then heard the captain told everyone to evacuate and he went out through the window. Outside he saw that the fire grew big very fast.

The highlights from the F/E interview are

- He was the one controlling/actuating of the engineering system in-flight, under the direction of the pilot. He sat behind the captain (in lower seat) and therefore can not see outside.

1.16.2 Flight Data Recorder and Cockpit Voice Recorder

FDR shows data from the last 4 flights, 2 flights from Sentani to Wamena and 2 flights from Wamena to Sentani.

Compared the last two flights to Wamena: the last flight has the “S” pattern in which the bank angle was 28 and 27 degree, while the flight prior before that has not. The cruised speed at the last flight was slightly higher (preliminary data = 458 compared to 429). Preliminary calculation shows that 15 seconds before above RW threshold, the speed is still 325 m/s, and bank angle is 25°. Above the runway threshold the speed is 290 m/s and the bank angle is -15°. (see 0)

The outer casing of the CVR was in good condition. The condition of the recording wire on one of the reel, however, was improperly winded, and some of the wire jumped out of its pattern and hooked on the reverse switch. The winding pattern is up and down. After some part of the bad reel was moved to the other reel, it is found that the wire is entangled and can not be moved further. Therefore, the wire is cut near the entangled part.

The part taken from the bad reel and its connected part from the good reel (the outermost) were analyzed. Wire from the good reel recorded conversation about a flight from Wamena to Jayapura, in which concluded that the flight landed safety. Therefore, it is concluded that the record is not from the accident flight. The part from the bad reel contains recording of take-off preparation from Wamena. Therefore, it is concluded that there is no acoustic information on the accident flight in the CVR. It is estimated that the entanglement of the wire occurred few days before the accident flight.

1.16.3 Nose landing gear failure analysis

The nose landing gear was found detached and burned heavily (see Appendix C -). The fracture surfaces at the landing gear strut mounting to the fuselage frame were damage by fire and therefore recognition on any indication of fatigue was not possible. The tires were burn out by the fire. The front part of then landing gear strut was damaged from scraping with the runway. Some melted magnesium alloy from the fuselage was found in the landing gear strut.

1.16.4 Documentation research

Research performed on the documents sent by Estonian DGAC and the documents recovered from the aircraft. The aircraft history documents show that:

1. The aircraft did not fly during 1992 to 1993, and during 1996 to 2000. Meanwhile the airframe overhaul program is 3000 hrs/3000 cycle/7 years. Since during 1st seven years of operation neither the hours nor cycle has been reached airframe life extension program was performed. First extended to 10 years (1994), then to 17 years (2001) when the 1500 hr inspection is repeated.
2. The aircraft was owned by Enimex starting on 2001.
3. Additional requirement was put on 2000 by Estonian DGAC that is to NDT nose for every 250 hrs and check reverser hydraulic bolts and lock every time reverser was used. This was according to Antonov Design Biro directive.
4. The aircraft was modified to be similar to AN-72-100 on July 4, 2001, in which the military equipment (mostly avionics) onboard was removed.

List of defects was summarized below. Most of the defects listed have been eliminated on the 500 hr check on Feb. 2002. The ones which repair is pending did not relevant with the nature of the accident.

No	Subsystem	Description
1-3, 5, 23, 26-27	Indicating lights	Not function properly
4 & 7	Avionics "Buran"	Display unclear (weather information)
6	Autopilot	Disengaged
8	SD-75 (DME/VOR)	Not function properly
9	NWS	Not function properly
10-11	Engine	Temp. indicator & engine control not function properly
12	AC	Thermostat not function properly
13	Landing wheel	Reserved
14, 19, 28	Radio/radar	PSH
15, 22	Pitot	USIM-1 (for IAS), DISS (for true airspeed correction)
16	Engine	SW (engine starter)
17-18, 30,31,33,35,37, 39-41, 42	Structure	Window, damper, spoiler, ramp lock, damage on wing, corrosion, cabin
24	Radio altimeter	Flying on mountain
25	Avionics	PKP(attitude sensor/gyro), MGV (artificial horizon sensor)
29, 38	Hydraulics	Leak
32	Actuator	Ramp; broke

1.17 Organizational and Management Information

Aircraft Owner : ENIMEX LTD.
Address : Pae. Str. 12, Tallinn 11414 Estonia
Certificate Number : 1-44/2000
Aircraft Operator : PT. TRIGANA AIR SERVICES
Address : Komplek Puri Sentra Niaga , Jl. Wiraloka Blok
D 68-89-70, Kalimalang, Jakarta 13620,
Indonesia
Certificate Number :
Operator Designator :

The Enimex LTD and Trigana have Aircraft Long Term Chartered Agreement dated 5 February 2002.

ES-NOP did not have Type Certificate to operate in Indonesia. The Certificate Of Airworthiness is not validated as regularly done to aircraft operating in Indonesia (use the C of A from Estonia). Special flight permit was given by Indonesian DGAC per request of Papua local government. It is to be noted that according to Chicago Convention ICAO:

1. For aircraft over flying or making a stop – technical non-commercial, the C of A of a member ICAO states is automatically recognized by the State of Landing.
2. In case of lease (wet lease) and the registration is still Estonian the responsibility of safety oversight is still the CAA Estonia, unless delegated to DSKU Indonesia. ICAO Convention (art. 31) recommends delegation of authority (DSKU) in case of long duration of the lease.
3. In practice, Indonesian DGAC engineers/experts would visit the manufacturing state-in this case Ukraine for review of the regulation as well as making effort to recognize the airworthiness regulations of Estonia.

1.18 Other Information

None

2 ANALYSIS

2.1. Flight performance

According to the landing performance chart from Antonov manual, with assumption of airport elevation of 1500 m, temperature 20°C, and zero wind, AN-72 with total weight of 33000 kg would need 950 m runway. At the time the total weight was 30981 and the runway length is 1650. Therefore, the aircraft was not overloaded for the destination runway.

2.2. Over speed approach

The aircraft speed upon landing (FDR data) were compared to the previous land at Wamena and operation manual.

Flight phase	Manual for landing weight 31.2 tons (km/h)	Accident flight (km/h)	Previous flight (km/h)
Before landing gear	350		
Flap 10/25	335	345	340
Final (full flap)	240	300	235
Touch RW	225	275	

Therefore, it can be concluded that the aircraft was over speed upon the accident landing. The FDR analysis also noted that the aircraft never fully deploy its flap due to over speed on final (see 0).

2.3. Traffic and environment

Radio transmission recording from Wamena tower shows that there are 5 aircraft on the area at the time of the accident. Figure 6 show the estimation of the aircraft positions at 00.07 and 00.09 over-laid on Wamena area map (see Appendix B -). At 00.09, ES-NOP and ER-AFQ were at the same horizontal position, which is at Yiwika or at the opening of the gap. Here ES-NOP, who flies faster and higher, overtook ER-AFQ. At the same time, ES-NOP also anticipated the outgoing traffic, PK-YPQ. The two constraints put limitation on ES-NOP descent maneuver. It was forced to perform a steep descent since ES-AFQ was below it and, anticipating the incoming traffic, it can not go far to the right as it did on the previous landing. Such maneuver contributes to the failure of the aircraft to achieve its proper landing speed.

Radio transmission recording show that, knowing there are two aircraft at the same position at 00.09, the air traffic controller did not explicitly declare who should land first.

2.4. Landing gear

Metallurgist and AN-72 engineer determined that the nose landing gear/wheel fail due to static overload from over speed landing. It is very possible that the right main gear touch the runway first due to the maneuver perform on approach, and therefore creating twisting force on the nose gear.

2.5. CRM

It is the common practice in CIS (ex-Soviet) aviation that flight crew set is barely changed. In the accident flight, the PIC was not belonging to the regular set. He, instead, replaced the regular PIC, who was sick at the time. Such practice weakens the CRM and therefore is a contributing factor to the accident.

3 CONCLUSIONS

3.1. Findings

- ◆ The crew performed visual approach to Wamena airport at airspeed exceeded the provision on AN-72 manual
- ◆ The crew failure to estimate distance to start the final turn properly made the unable to decrease speed and therefore unable to extend flap to landing configuration.
- ◆ The high rate of descent and flap configuration upon final activated GPWS warning
- ◆ The landing (touchdown) speed was exceeded the prescribed value in the AN-72 manual and the aircraft has slight drift angle at first touchdown.
- ◆ After the first touch the aircraft bounced three times. This and the fact that the aircraft was at high loading lead to the failure of the nose gear.
- ◆ The fire was caused by the heat from the friction as the aircraft components skidding on the runway and the presence of hydraulic fluid leaking from the damaged system.
- ◆ There is no indication of any malfunction in the aircraft system that could contribute to the accident.
- ◆ There is no indication of misconduct in the maintenance of the aircraft that could contribute to the accident.
- ◆ The fire brigade at Wamena airport was not in ready condition at the time of the accident, which leads to failure to extinguish the fire in time. The failure resulted in heavy fire damage on the aircraft.
- ◆ The fire brigade was not able the handle the fire due to non-serviceable equipment and lack of training for the personnel.
- ◆ Government check pilot need to perform close supervision (onboard the flight or give exams) to AN72 crew according to CASR 121 and CASR 61. By the time the report is written, the investigation could not find the necessary document that stated whether PT. Trigana has the authority to represent the government on the matter.

3.2. Safety Threats

It is to be noted that there is blank radio transmission area at the gap. The Aviation Safety of Department of Communication plan to install relay antenna to resolve the problem. In the meantime, the authority required all aircraft passing the gap to perform blind transmission.

It is to be noted that the lack of type certificate made the investigation progress very slow. The difficulty was due to lack of knowledge in the Indonesian authority on the technical aspect of the aircraft. Indonesian DGAC stated that the special permit for non-TC aircraft to operate in Papua will only valid until 2004.

4 RECOMMENDATIONS

- ◆ For Wamena airport to regularly check the equipment and train the fire brigade personnel.
(Action has been taken by the Aviation Safety of Department of Communication to supervise the remedial action)
- ◆ There is a need to install more navigation aid at the airport as well as publish holding and go-round pattern knowing that the traffic sometimes high.

APENDICES

Appendix A - FDR results

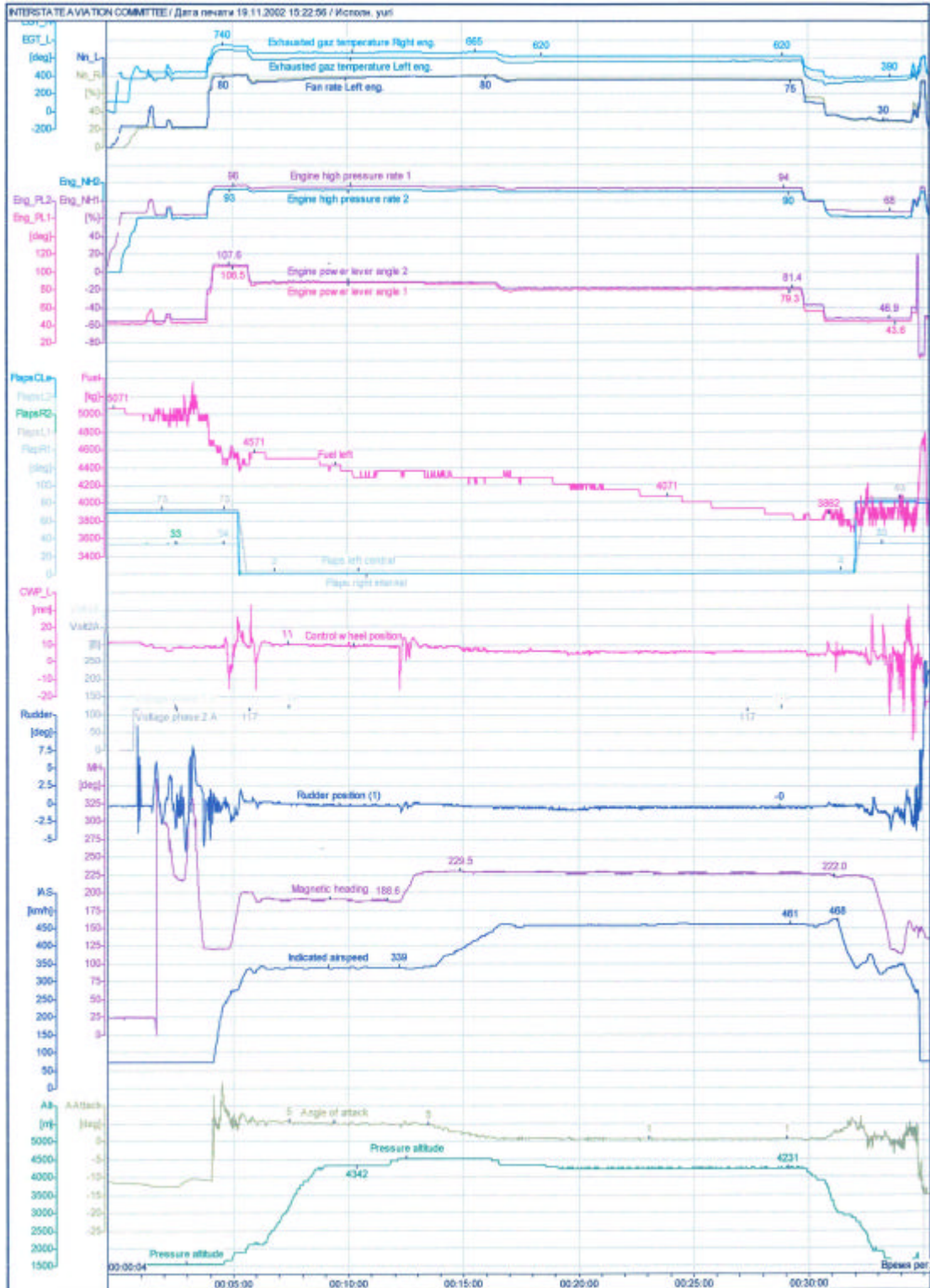
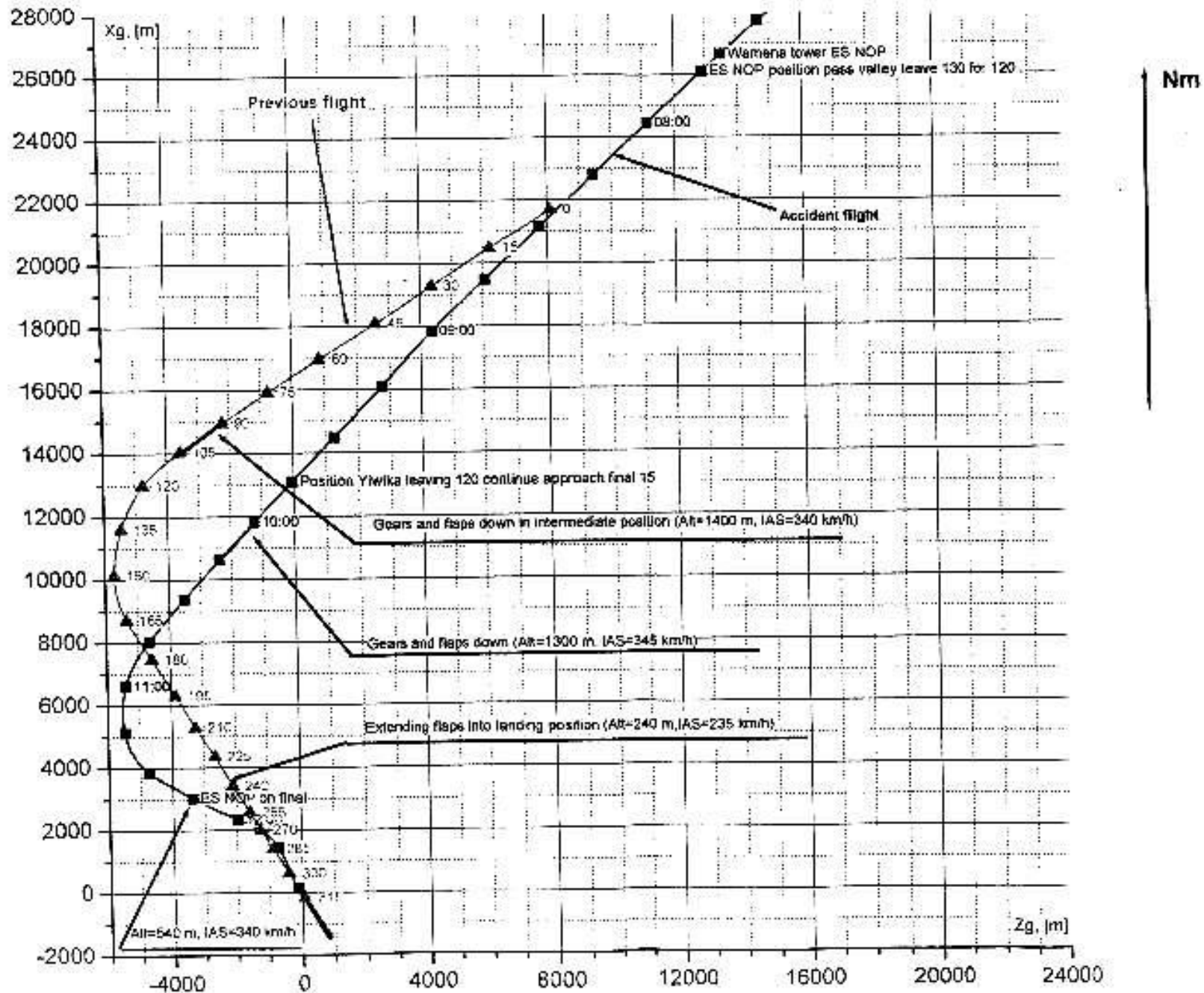


Fig. 2 An-72 ES-NCP21.04.02 at Wamena (Indonesia) flight parameters

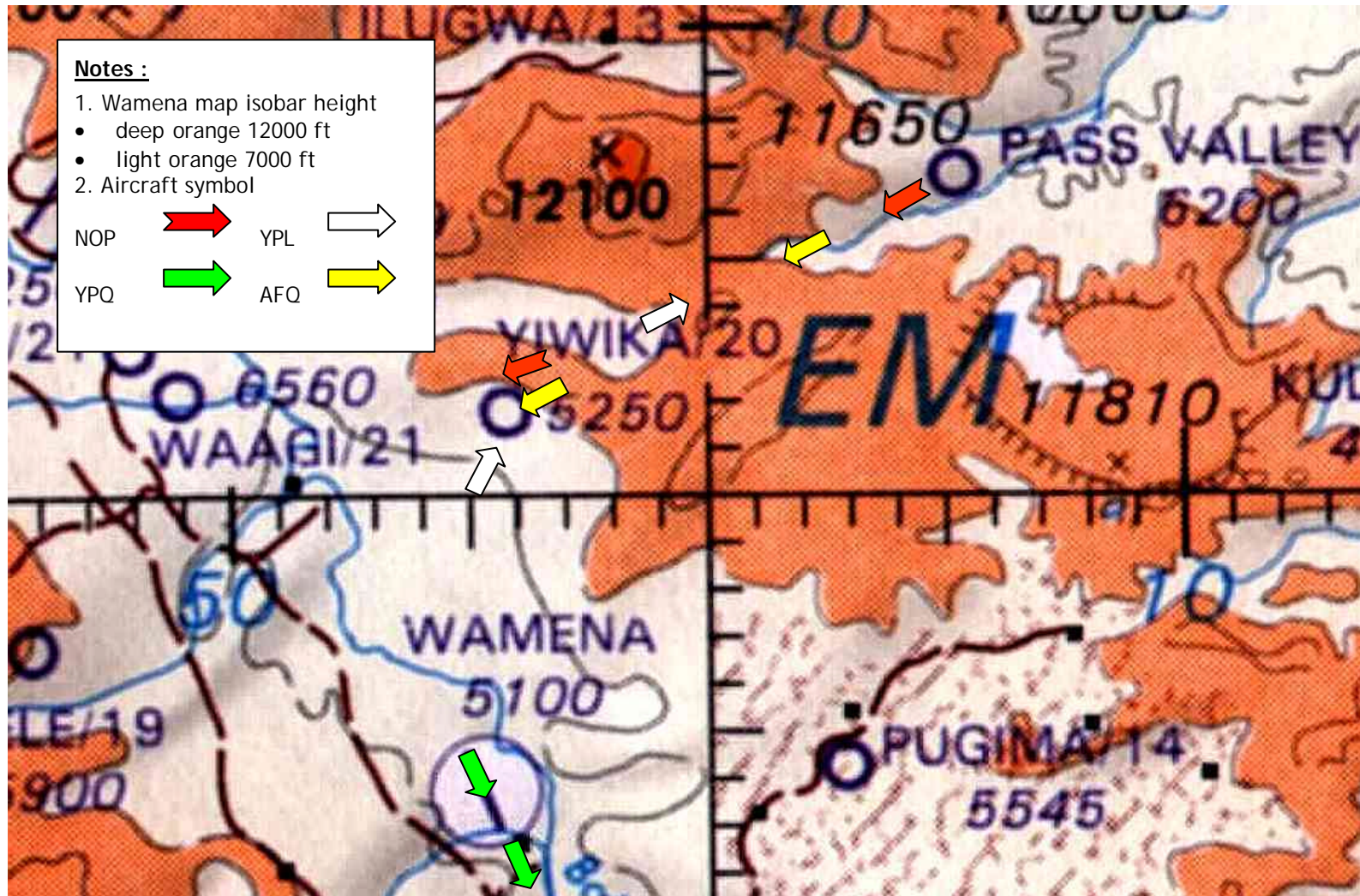


Fig. 3 An-72 ES-NOP flight parameters while landings at Wamena airport (Indonesia) on 21.04.2002.

Pic. 4 Flight path of the Antonov 72 aircraft on April 21, 2002 while landing in Wamena airport



Appendix B - Situation at Wamena at 00.07 and 00.09



**Appendix C - Aircraft damage and
Landing gear**

