Aircraft Accident Investigation Board, Norway HSL

REPORT

PO Box 213, N-2001 Lillestrøm
Telephone: + 47 64 84 57 60
Telefax: + 47 64 84 57 70

REP: 41/2000
Date: 15.08.2000

All times given in this report is local time (UTC +1), if not otherwise stated.

Aircraft	
-type & reg.:	Ilyushin Il-76TD, RA 76750
-year of man.:	1981, (20 939 flight hours)
-engines:	4 Soloviev D-30KP
Radio call sign:	AFL 9905
Date and time:	4 February 2000, at 0455 hrs
Location:	Runway 27 at Trondheim airport Værnes (ENVA), 67° 27' N 10° 55' E
Type of occurrence:	Serious aircraft incident, the aircraft made a low final approach and collided with ILS localizer (LLZ) antenna at the approach end of the runway (localizer for approach RWY 09)
Type of flight:	Chartered scheduled cargo operation
Weather cond.:	Wind: 250° 35 gusting 40 kt. Visibility: + 10 km in showers of rain/snow. Clouds: few at 1 200 ft, scattered at 1 800 ft, broken at 3 000 ft. Temperature and dewpoint: 5 °C/ 1 °C. QNH: 993 hPa
Reported RWY cond.:	Runway sanded, coefficients 46 36 42
Light cond.:	Dark
Flight cond.:	VMC
Flight plan:	IFR
No. of persons onb. :	10, all crew
Injuries:	Nil
Aircraft damage:	Nil
Other damage:	8 of the 12 elements of the ILS LLZ-09 antenna array were more or less damaged, 3 of them totally. Profiles belonging to the array damaged and out of position. Antenna masts were broken and cables and cable-connectors damaged as well. The antenna situated on top of the communication equipment building, of 1.40 m height over the roof, were put down. Some minor damages made on the top of the roof of the same building, and the obstruction light on the north side of the antenna array was moved out of alignment. The estimated cost of the repair is NOK 744.000,-.

Commander:	
-sex:	Male
-age:	59 years old
-licence:	Line pilot first class
-fl. experience:	18 000 flight hours
Co-pilot:	Male 26 years old Commercial Pilot Certificate 420 flight hours, of which 230 on type
Information sources:	A short report from the commander, a detailed report from duty air traffic controller at Værnes TWR, Flight Data Report (FDR), a report from Air Navigation Services at the airport, interview with Aeroflot Cargo chief pilot and AAIB/N own investigations.

SUMMARY

The aircraft was on a chartered scheduled cargo flight from Moscow airport Sheremetievo (UUEE) to Trondheim airport Værnes (ENVA). The flight was uneventful until final approach to runway 27. The commander was the pilot flying (PF). The weather at the time of the approach was unstable with strong westerly to south-westerly variable winds, turbulent conditions and showers of rain/snow.

At time 03:39:45Z, RA 76750 established contact with Værnes TWR. The flight crew received information of RWY in use, actual weather and RWY conditions. The aircraft was approaching the airport from SE and was given radar vectors to intercept ILS RWY 27. Descent clearance to FL 90 was given.

At time 03:43:45Z RA 76750 received clearance for descent to 6 000 ft on QNH 993 hPa. Between the time 0344Z and 0345Z there was communication between the aircraft crew and Værnes TWR clarifying the radar vectoring procedure for RWY 27. Descent clearances to 5 000 ft and 4 000 ft were given. At time 0350Z, RA 76750 was established on the ILS, and was cleared to land on RWY 27. Wind report was given by TWR: "250^{o} at 35 gusting 40". A new wind update was given at 0353Z: "240^{o} 36".

When the landing lights became visible, the duty air traffic tower controller observed RA76750 to be lower than the normal glide path.

RA76750 landed at time 03:55:00Z. When passing over the runway end, the aircraft's landing gear collided with the localizer antenna installation. At the same time the alarm for LLZ RWY 09 operation failure was heard and seen in the tower. After parking, the crew was requested to report in the control tower.

Trondheim airport Værnes is equipped with several navigation aids for approaches from both east and west. (See Enclosure no. 1: AIP NORGE/NORWAY AD 2 ENVA 5 – 3. INSTRUMENT APPROACH CHART ICAO ILS-27). There are ILS's installed for both main RWY's.

The glide path (GP) of the ILS RWY 27 has an angle of 4,0^{o}. There are two markers, a TACAN and a NDB available as aids for this approach procedure. When stabilized on the GP for RWY 27, the outer marker should be passed at 2 900 ft. The NDB HG (Hegra) which is situated 3.4 NM from the RWY end should be passed at 1 660 ft. The middle marker (approx. 1 NM from RWY end) is co-located with the Missed Approach Point (MAPT). The localizer is pared with Værnes VAE TACAN station. This gives the flight crew the possibility of double checking the navaids during an approach. RWY 27 has also a PAPI installation with an approach angle of 3,4^{o}.

The ILS and all other radio navigation aids for RWY 27 at ENVA were working normally during the RA 76750 approach. Normal operation of the ground installed navaids was confirmed later in the day by a control flight made by the flight inspection aircraft of the Norwegian CAA (LN-ILS).

The contour of the terrain underneath the approach path for RWY 27 (Stjørdalen) at the airport is displayed on the map attached to this report. (See Enclosure no. 2.) It should be noted that there is a steep up-slope of approx. 10 m height, shortly in front of the runway end. This is where the LLZ antenna for RWY 09 is situated.

The Norwegian CAA has in AIP published a caution/warning valid for the airport: (This information is published on the Jeppesen information for the airport. Aeroflot is using Jeppesen flight information.)

> "Wind shear/eddies may occur on short final to all runways at SE–S winds above 25 kt. Loss of headwind may occur on short final runway 27 at wind W above 20 kt."

During the days of 7 and 8 of February 2000 AAIB/N had interviews with the duty TWR controller, a representative of the local police and representatives from Aeroflot Cargo. The company's representatives delivered a requested readout from the FDR together with a graphic presentation of the approach profile. From this readout it can be seen that during the final approach from approx. 1500 ft, the aircraft was below the desired glide path. (See Enclosure no. 3.)

In order to complete the investigation of the incident, the AAIB/N sent 22 February 2000 the following 8 questions to Aeroflot Cargo Flight Safety Department:

"AAIB/N request, if possible:

1. A statement from the commander on <u>why</u> the aircraft was flown so low on the final part of the flight.
2. We would also be very interested in co-pilot's impression of how the flight came to depart from the normal glide path for runway 27 at Trondheim airport Værnes.

3. Was there a problem in receiving the 4,0° glide path signals?
4. Did the crew notice the 3,4 ° PAPI?
5. Did the reported runway conditions (46 36 42) have any significance on the execution of the approach?
6. What effect did the gusty wind conditions have?
7. Does Aeroflot utilise Crew Resource Management (CRM) training?
8. Did the co-pilot, or any other crewmember, inform the commander of the deviation from normal glide? Was there a reaction? If so, why was the flight path not corrected?"

On 2nd Mai 2000 Aeroflot Cargo, Chief of Flight Safety gave the following answers:

1. "The PIC considered that the following factors are the most probable reasons for unintentional fly below glide slope:

   - glide slope failure at 7 – 8 km from RWY;
   - absence of information about unserviceable PAPI;
   - altimeter error (30 m plus);
   - wind share and downward current before touchdown;
   - erroneous determination of stopway as displaced RWY threshold.

2. The opinion of co-pilot is that fly over below glide slope on final approach occurred due to wind share and influence of downward current before touchdown, as well as due to erroneous determination of stopway as displaced RWY threshold.
3. The crew determined absence of signals from ILS at 7 – 8 km from RWY.
4. The crew failed to see PAPI lights.
5. The crew had no reported runway conditions.
6. While approaching the ground the wind shear caused serious settling of a/c and altitude loss relative to normal glide slope.
7. Crew Resource Management training is carried out in accordance with the program approved by Federal Aviation Authority of Russian Federation.
8. There were no reports on deviation."

The chief TWR controller at Trondheim airport Værnes has confirmed to AAIB/N that there were no NOTAM published regarding any RWY threshold displacement at the time of the incident. The PAPI installations were also working normally at the time of the approach.

With reference to the readout of the communication between the crew and the duty controller at the tower, it can be stated that the crew of RA 76750 at time 0340Z requested runway conditions. The controller answered. "We have sanded runway, and it's 46 36 42". This message was received and confirmed by RA 76750 at time 0341Z.

The commander of RA 76750 comments to the draft of this report among other items:

> The crew had initially the information that the RWY was covered with snow and that the friction coefficient (my-factor) was poor. After contact with TWR the flight

crew received additional information about availability of RWY conditions for a safe landing.
There was a glide slope failure at 7- 8 km from the RWY. The PAPI lights were not visually determined.
After arrival on base, test of aircraft equipment was made without remarks.

The commander also gives in his reply the following recommendations:

- The CAA should consider information submission to flight crews deviating from normal glide path while on final approach.
- Stopway and RWY threshold should be made more clearly visible with the lights.

AAIB/N COMMENTS AND ANALYSIS

It is confirmed that the ground installation of the ILS to RWY 27 with markers and NDB were operating normally at the time of the approach. This is also valid regarding the TACAN. It can therefore be concluded, when the crew stated that they had lost the ILS signals 7 – 8 km from the airport, the lack of GP information, most probably was caused by a failure of the aircraft's own airborne equipment. When there is a failure of the GP signals an approach can be continued, but this automatically changes the landing minima to higher values. As the cloud base and the visibility were adequate, this should not have created any problem for the crew. The runway came in sight in good time during the approach, and the descent could be continued visually. The available glide angle information from the PAPI was not utilized. It is important that optimum use of all visual references is made, especially during approaches in darkness. It is the opinion of AAIB/N that in spite of the rain showers, the strong winds and downdrafts, a normal stabilized visual approach with a correct approach angle could have been executed. Even if the radio signal from the GP was missing, sufficient navigation aids were available to execute a normal landing. The effect of the actual strong westerly winds at the airport is well documented as a warning in the airport information. The crew was aware of the effect of turbulent air, downdrafts and wind shear.

The available runway length was the normal runway. No information of reduction of the full length of 2759 m or any displaced threshold had been published in a NOTAM. The braking action conditions were transmitted to the crew during the initial approach. The values indicated a runway status close to "summer conditions". AAIB/N is of the opinion that the actual status and the length of RWY 27, combined with the strong headwind component, should not give any problems for planning a normal landing. AAIB/N can not see any reason justifying an approach below glide path.

The commander was the pilot flying during the approach. It may be noticed from the flight recorder readout that most of the final approach was executed below the normal $4{,}0^{o}$ glide path. In spite of the fact that the crew had received CRM training, no "callouts" or other "info" were given to the PF from the rest of the crew. It is noted that that the co-pilot's flight experience was somewhat limited. AAIB/N is of the opinion that assistance or more stringent co-operation with the PF would have been helpful and could perhaps prevented this serious incident. Information of the position of the aircraft in relation to a normal

approach glide angle could have risen the commander's awareness of the danger of the low flight path. If the aircraft had been a few meters lower when passing the LLZ antenna, the flight could have ended as an accident. AAIB/N consider that the flight crew should have reacted on the deviation from the normal glide path. This is also normal procedure where CRM is utilized.

It is important for a flight crew to stabilise the flight with accurate speed and correct attitude during an approach. The aeroplane should be stabilised on the correct safe glide path. A correct glide path should be checked at frequent intervals in relation to the other available navigation aids. When doing so, and considering the correct airspeed and attitude for the strong winds, the flight crew is in a position where minor corrections will maintain the aircraft in a safe state. If varying winds and downdrafts tend to bring the aircraft away from a correct path, quick adjustments would return the aircraft to a safe flight path. A normal executed flight path should pass over the runway threshold at a height of 50 ft (15 m), and end with a touchdown some 300 m in on the runway.

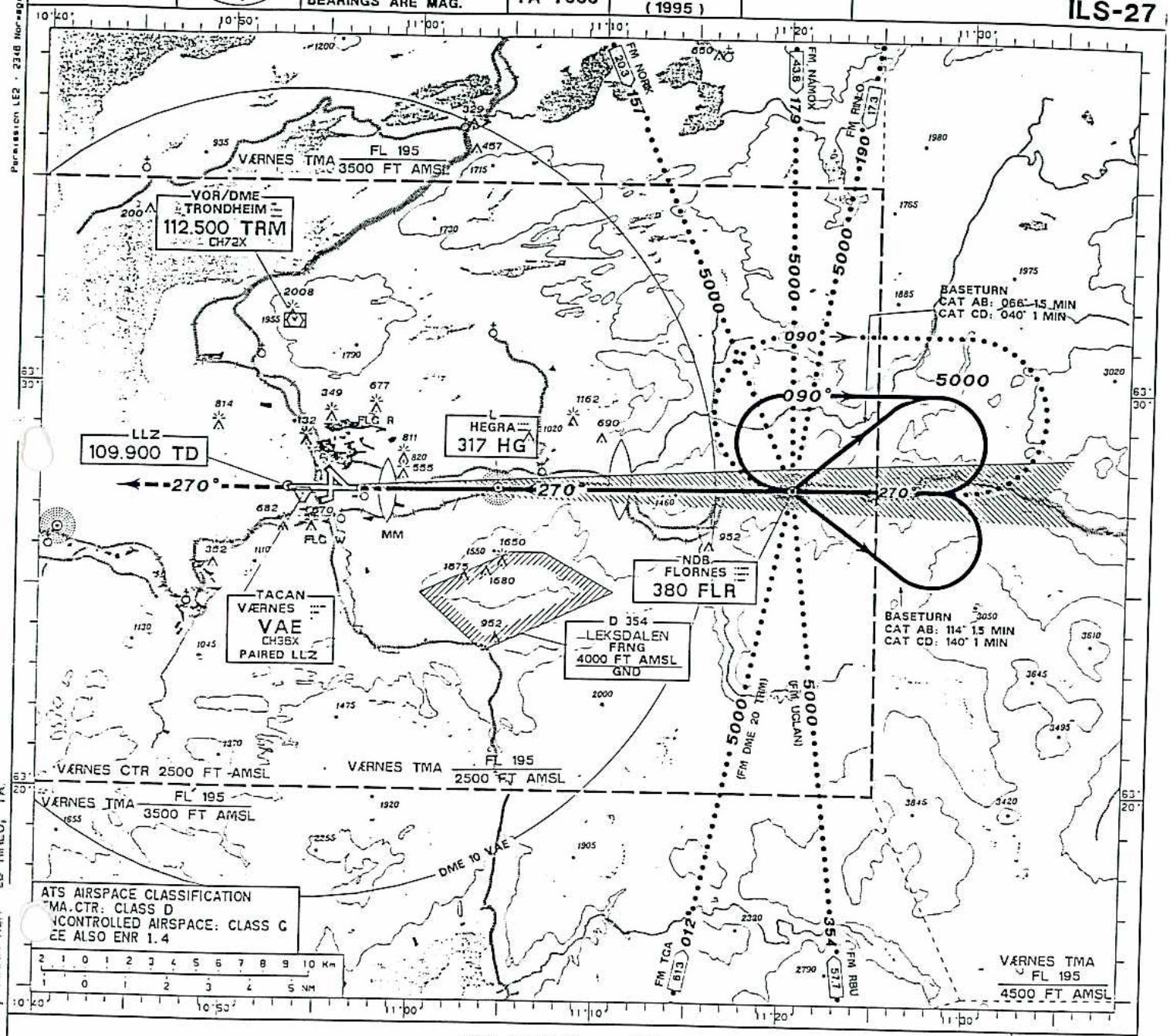
Concerning the commander's recommendation regarding the Norwegian air traffic controller's lack of reaction when observing the low approach, it is appropriate to state that it is not in his duty to act upon a visual observation of this kind except in obvious extreme cases.

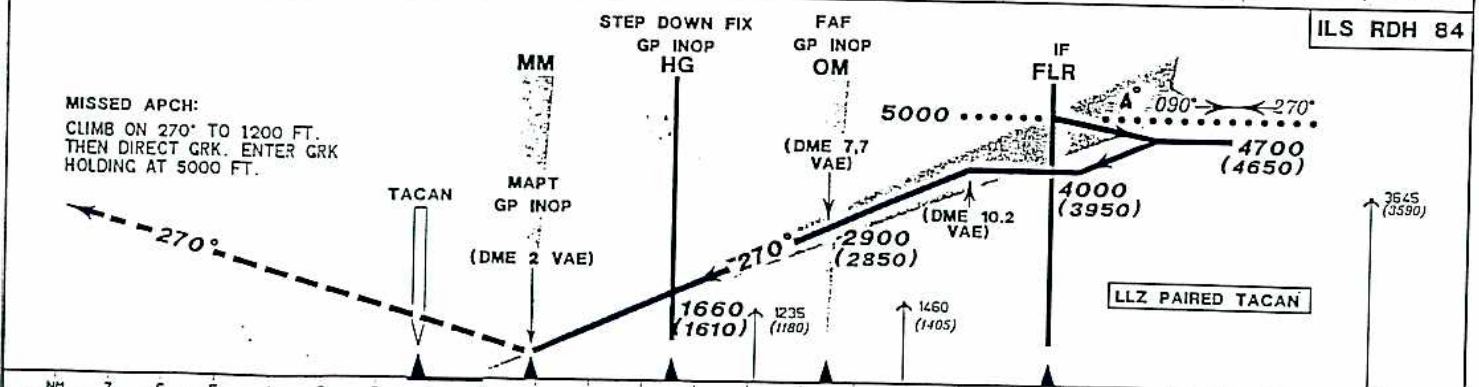
RECOMMENDATIONS

AAIB/N recommends the FAA of the Russian Federation to consider the possibility of improving the efficiency of the present CRM training in Aeroflot Cargo crew training (Recommendation 51/2000).

3 Enclosures
2 photos

INSTRUMENT APPROACH CHART-ICAO 1:275000	MNM SECT ALT	HGT RELATED TO THR 27 ELEV 56 FT. CIRCLING HGT RELATED TO AD ELEV 56 FT. ALTITUDE, ELEVATION AND HGT IN FT. BEARINGS ARE MAG.	TWR 119.400 133.750 122.100	APP TAR 118.600 119.150	VDF 118.600	ATIS 127.550	TRONDHEIM VÆRNES NORWAY
			TA 7000	VAR 0° (1995)			ILS-27



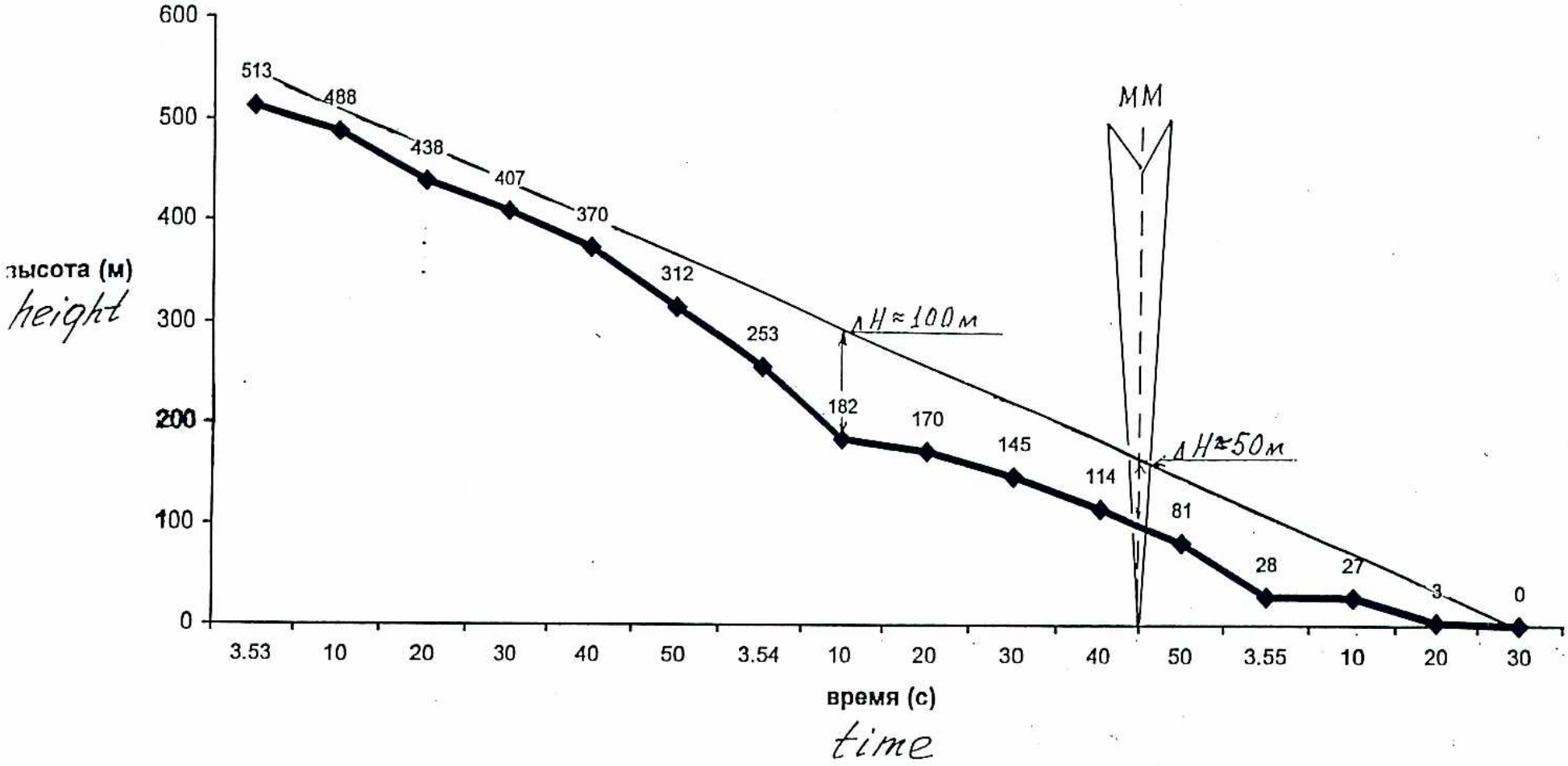


CAT OF ACFT		A	B	C	D
OCA (H) STRAIGHT-IN		290(230)	305(245)	320(260)	335(275)
	GP INOP	800(750)			
CIRCLING		1400(1340)		2050(1990)	

NOTE: CIRCLING S OF AD ONLY

FINAL APPROACH	DISTANCE FM OM TO MM 5.66 NM					
SPEED	KT	80	90	120	150	180
TIME	MIN:SEC	5:40	3:47	2.50	2:16	1:53
RATE OF DESCENT	FT/MIN	425	638	851	1063	1276
DIST DME		7	6	5	4	3
ALT(HGT)		2640(2580)	2210(2160)	1790(1730)	1360(1310)	940(880)

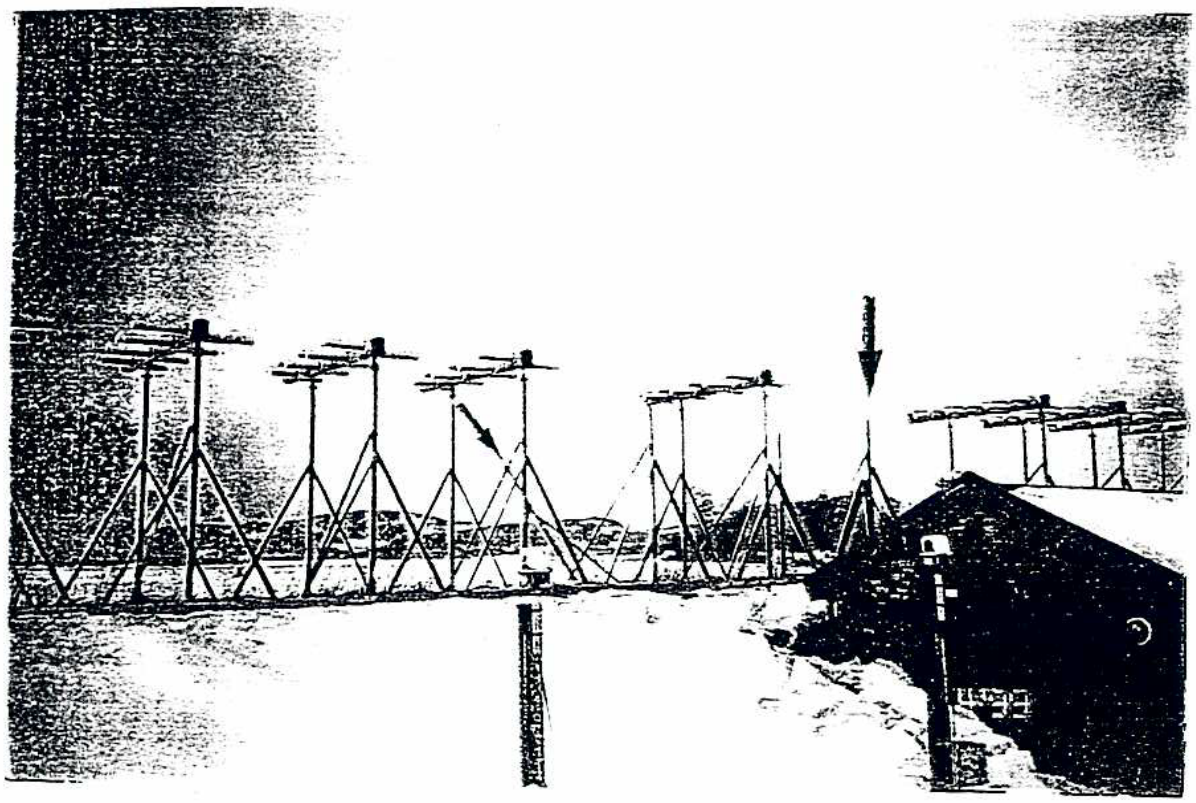
in Trondchein



3-View of IL-76TD deleted. Unable to find copyright owner (it's not Jane's).

Ilyushin Il-76T four-turbofan heavy freight-carrying transport

(JANE: ALL THE WORLD'S AIRCRAFT 1980 – 81)



LLZ-09 ANTENNA ARRAY AND THE EQUIPMENT BUILDING