



Early Descent Leads to Grief

Deficiencies in flight crew coordination, preparation and execution of a non-precision approach, and premature let-down are cited in Alaska accident.

(Compiled from U.S. National Transportation Safety Board releases and Pan Am safety information)

On June 2, 1990, during a mid-morning positioning flight with only four crew members on board (two pilots and two flight attendants), MarkAir Boeing 737-200 descended prematurely during a localizer DME approach to runway 14 at Unalakleet, Alaska, U.S., and struck the ground about 7.5 miles short of the runway at 0937 hours local time. While the aircraft skidded several hundred feet on relatively flat tundra, its engines, portions of the structure, and eventually the tail section separated before it halted and turned 180 degrees from its original direction. The aircraft was destroyed but there was no fire.

A flight attendant seated in the rear jumpseat received serious pelvic injuries, but the remaining crewmembers suffered only minor injuries. Weather at the airport was: estimated 500-foot overcast, visibility 1.5 miles in fog, temperature 48 degrees F, wind calm, altimeter 29.94 inches.

One of the flight attendants (who apparently had expressed an earlier interest in watching the approach and landing from the cockpit) was invited into the cockpit shortly after the flight began its descent from FL 310; she arrived approximately four minutes later. Based on the cockpit voice recorder transcript, she was quiet and her presence did not seem to cause any distraction to the flight crew.

During descent, the captain briefed the first officer that he was going to make a teardrop procedure turn to expedite the arrival. He then stated (correctly) that the procedure specified being at 1,500 feet MSL at five DME ("...three thousand till we're inbound Drige at fifteen five, at ah

two point three mile fix down to three sixty...").

The airport is not served by radar. The aircraft passed over Unalakleet (UNK) VOR at an altitude of approximately 4,000 feet, tracking outbound on a course of about 291 degrees descending toward 3,000 feet, the initial approach altitude.

As the airplane approached the localizer course at the completion of the teardrop procedure turn, the captain apparently forgot that he briefed being at 1,500 ft at five DME and stated: "Fifteen hundred to ten what we're shootin' for." The first officer responded: "Okay." At that point the crew seemed to mentally jump one step-down ahead of the published approach procedure and the accident scenario was set. Seconds before impact the captain sighted the ground and initiated a sharp pull-up sufficient to align the aircraft with the rising terrain. The altered trajectory spread impact loads sufficiently to prevent the airplane's complete destruction at the point of initial ground contact.

The airplane was equipped with a Mark I GPWS. There was no GPWS warning because the airplane was properly configured for the approach, the sink rate was normal and no glideslope was available. Had the airplane been equipped with a Mark VII GPWS, automated altitude callouts would have occurred at 20 seconds, 15 seconds and 5 seconds before impact.

Following are excerpts from the transcript of the cockpit voice recorder that was removed from the aircraft. The

full recording began at 0906:32 local time as the flight was level at its cruise altitude of FL310 and continued until 0937:51.7 when the recorder stopped after the sound of the impact. During the first seven minutes of the recording, the crew talked about general aircraft systems. The flight started its descent into Unalakleet at 0913:48, the captain briefed the instrument approach at 0915:58 and the aircraft was cleared by center for the localizer runway 14 approach at 0922:12. A female flight attendant entered the cockpit at 0918:30 and remained seated there until the end of the recording.

Legend

CAM	Cockpit area microphone voice or sound source
MRK3087	Radio transmission from accident aircraft
CAPT	Voice identified as Captain
F/O	Voice identified as First Officer
F/A	Voice identified as a female Flight Attendant
CTR	Alaska Enroute Air Traffic Control Center
COMP	MarkAir Company Dispatcher at Unalakleet Station
NOME	Nome Alaska Flight Service Station
MRK87	MarkAir Flight Eighty Seven
*	Unintelligible word
#	Expletive deleted
(())	Editorial insertion
—	Pause

(Note: All times are expressed in Alaska Daylight Time. Only radio transmissions to or from the accident aircraft were transcribed.)

Intra-Cockpit

Air-Ground Communications

0915:58 CAPT plan the localizer one four you got it out via Unalakleet which we're headin' to the feeder fix two ninety one six point one miles which takes us to Drige Drige I'll just do a quick procedure turn headed back in so I'm not going to straighten' out on the thing the localizer just teardrop and come right back around and land

0916:16 F/O okay

0916:17 CAPT three thousand till we're inbound Drige at fifteen five, at ah two point three mile fix then down to three sixty which is corresponding to three thirty nine above we got good enough vis in the event we don't see it climbing right turn to three thousand out the two oh five and then ah we'll talk about figure out what we're gunna do after that once we get out there

0916:40 F/O okay

0916:42 CAPT plan ah we'll do a flaps

Intra-Cockpit

Air-Ground Communications

thirty one twenty three thirty eight plan medium on the auto brakes goin' through five make sure you start up the APU and when we roll in on final switch the bleeds to off

0916:56 F/O okay

0917:07 CAPT standard callouts see anything you don't like or anything you question just feel free to call it

0917:11 F/O okay

0917:15 CAPT I've been known to screw up on a regular basis

0917:18 F/O you're not the only one

0917:20 CAPT hopefully that's why there is two of us up here

0917:22 F/O that's right that's the whole idea behind it

0917:36 CAPT we're gunna lose him here on twenty seven oh here real quick

0917:41 F/O waitin' for him to talk and I was in a —

0917:44 CAPT there he is

0917:45 F/O * listen to him over there anyway

0917:49 CAPT yeah because it ah twenty seven oh you can't reach and AWOS is suppose to be off but I'm gunna try it here

0918:00 CAPT yeah it ain't there

0918:04 F/O hear it at all

0918:05 CAPT uh uh there ain't nothin' there

0918:08 CAPT should be able to hear it this far out —

0918:30 CAM ((sounds similar to person entering the cockpit))

0918:31 F/A Michelle's writin' a letter

0918:36 CAM ((sound similar to jump seat being unfolded and set up))

0919:05 CAPT there's the river — they are going to try to put us out first see with fifteen minutes they are going to try to load this thing ASAP and hopefully have at least half of it loaded before Blee [Name of captain in following MarkAir aircraft. —

Intra-Cockpit	Air-Ground Communications	Intra-Cockpit	Air-Ground Communications
Ed.] even gets in which I think they are being real optimistic			<i>four call you out of ten thousand then out of five thousand on Nome radio</i>
0919:19 F/A I think they are —			0922:39 CTR <i>thirty eighty seven read back correct for MarkAir eighty seven change to my frequency now one two seven point zero</i>
0919:20 CAPT those guys are only about —			
0919:21 F/A unless they have some agents down here from Anchorage or something I doubt —		[During the period between 0922:39 — 0925:12 there is a cockpit discussion about the jumpseat and its use by flight attendant, and operation of auxiliary power unit. — Ed.]	
0919:25 CAPT they are only ten to fifteen minutes behind us too			0925:12 MRK3087 <i>MarkAir thirty eighty seven is out of ten thousand</i>
0919:29 F/A you know what they * *			0925:32 MRK3087 <i>Anchorage center MarkAir thirty eighty seven out of nine thousand three hundred</i>
0919:39 CAPT I tried I wanted to get Bleeps out of there first park where that way they could load them up we'd take the excess and go on home at our leisure*		0925:41 F/A they don't care	
0919:48 F/A (sound of laugh)		0925:43 CAPT they can't hear you once you get down that low they should know that	
F/O ((sound of laugh))		0925:46 F/O I'll just get 'im out of five on Nome radio	
0919:49 CAPT but no such luck		0925:49 CAPT or you could just have eighty seven relay it	
0919:57 F/A * *		0925:52 F/O okay	
0920:04 CAPT nine nine four flaps thirty one twenty three we'll plan medium bleeds off and I'm ready for the the checklist		0925:54 CAPT that'll work but they're not on this freq	
0920:10 F/O okay anti-ice is off air conditioning and pressurization is comin' down		0925:56 F/O yeah —	
0920:15 F/O start switches low ignition altimeters and instruments niner niner four three times		0925:57 CAPT you'll have have to get them on that freq	
0920:20 F/O out of eight nineteen		0926:01 COMP <i>thirty eighty seven MarkAir Unalakleet</i>	
0920:24 F/O EPR and airspeed bugs are set and go around		0926:03 MRK3087 <i>hello</i>	
0920:31 F/O instrument approach localizer runway one four descent approach checklist complete		0926:05 COMP <i>yeah we're gunna have a change to the zero fuel weight I don't have it ready yet but you can disregard the first one and ah could you say again your fuel please</i>	
0921:33 CAPT MEA changes at forty five DME to four thousand five hundred		0926:14 MRK3087 <i>ah should be about eighteen</i>	
0921:37 F/O okay		0926:22 COMP <i>okay thanks</i>	
0921:38 CAPT it is eight out here	0922:12 CTR <i>MarkAir thirty eighty seven cleared for the localizer runway one four approach to the Unalakleet airport report leaving one zero thousand this frequency and then report leaving five thousand to Nome radio</i>	0926:26 F/A where is the * * * *	
	0922:30 MRK3087 <i>MarkAir thirty eighty seven is cleared the localizer runway one</i>	0926:29 CAPT look at these needles and that straight off the nose nineteen point one miles right there	
		0926:35 F/A okay	
		0926:38 CAPT we can't go any lower than forty five hundred till I go that side then	

Intra-Cockpit**Air-Ground
Communications**

we'll go out turn ah out over the water and
turn back

0926:43 F/A oh really

0926:47 MRK3087 *eighty seven thirty
eighty seven*

0926:50 MRK87 * *what is your altitude*

0926:52 MRK3087 *yeah we can't reach him
once you get below ten why don't you tell
him we're through ten going to radio*

0926:57 MRK87 *okay understand you're
through ten huh*

0926:59 MRK3087 *we're we're through
seven right now if you want lower*

0927:02 MRK87 *okay*

0928:34 F/O what's her name Michelle is it
[Name of flight attendant. — Ed.]

0928:38 F/O *yeah Michelle we're just a few
minutes out here if you want prepare the
cabin for arrival [on aircraft public address
system. —Ed.]*

0928:42 F/O ((sound of laugh))

0928:46 CAM ((sound of altitude alert
tone))

0928:47 CAM ((sound of two cabin
chimes))

0928:48 CAPT APU comin' on

0928:49 CAPT she's ready

0928:56 MRK3087 *ah Nome radio
Unalakleet MarkAir thirty eighty seven ah
with ya out of five thousand one hundred*

0929:05 NOME *MarkAir thirty eighty
seven Nome radio good morning Unalakleet
latest weather report estimated ceiling five
hundred overcast visibility one and one half
fog temperature four eight dew point missing
wind calm altimeter two niner niner four*

0929:22 MRK3087 *good copy thanks*

0929:23 NOME *

0929:27 MRK3087 *I stepped on you in that
last bit what did you say*

0929:30 NOME *I was just appending to the
report special weather report's not available*

0929:37 MRK3087 *thank you*

Intra-Cockpit**Air-Ground
Communications**

0929:54 F/O good to three after U-N-K
here

0929:57 CAPT after the VOR

0930:00 MRK3087 ((*sound of Morse code
"K" identifier and VOR voice saying "occa-
sional two thousand scattered"*))

0931:01 CAPT comin' over the station
going out the two ninety one down to three

0931:04 F/O okay

0931:13 CAPT go ahead and put the
localizer on your side

0931:15 F/O okay

0931:16 CAPT let me know when we go
through it

0931:32 CAPT and we don't really need
radio anymore if you want to put ah twenty
three oh in just put it on advisories there
shouldn't be anybody here with this way it is
— famous last words — no our temp's warm
we don't need that

0931:58 F/O ah thousand to go

0931:59 CAPT checks

0932:06 CAM ((sound of altitude alert
tone))

0932:29 F/O localizer's alive on the right
one dot and centering

0932:33 CAPT go ahead and set it on my
side

0932:35 F/O okay

0933:16 CAPT flaps one

0933:17 F/O flaps one

0933:46 CAPT flaps five

0933:47 F/O flaps five

0933:55 MRK3087 ((*sound of Morse code
dash and letters "N K" heard on the Capt
radio channel*))

0934:01 CAM ((sound of slow trim in
motion horn))

0934:15 CAM ((sound of slow trim in
motion horn))

0934:25 CAPT comin' right

0934:29 CAM ((sound of slow trim in

Intra-Cockpit	<i>Air-Ground Communications</i>	Intra-Cockpit	<i>Air-Ground Communications</i>
motion horn))		0935:33 CAPT checked	
0934:37 CAPT flaps ten		0935:35 F/O landing gear	
0934:38 F/O flaps ten		CAPT down and three green	
0934:41 CAM ((sound of slow trim in motion horn))		0935:36 CAPT flaps twenty five	
0934:43 CAPT keep an eye on the temp for me if it drops looks like we need ice go ahead and put it on		0935:37 F/O flaps twenty five	
0934:47 F/O okay are you ready for it on		0935:38 F/O auto brake	
0934:48 CAPT no we don't really need it now just keep an eye on the temperature down there		0935:39 CAPT medium	
0934:51 F/O will do		0935:41 F/O speed brake	
0934:53 CAM ((sound of slow trim in motion horn))		0935:42 CAPT armed and green	
0934:55 F/O goin' to fifteen hundred inbound		0935:43 F/O okay flaps to complete	
0934:57 F/O checks		<i>0935:44 MRK3087 Unalakleet traffic MarkAir thirty eighty seven procedure turn inbound</i>	
0935:02 CAPT fifteen till ten DME		0935:54 CAM ((sound of altitude alert tone))	
0935:03 CAM ((sound of slow trim in motion horn))		0935:57 F/O go ahead and bring that ice on we're almost ten now	
0935:07 F/O you got the ten in right		0935:59 CAPT yeah go ahead	
0935:13 CAPT landing gear down medium on the auto brakes		0936:00 F/O comin' on	
0935:14 F/O extend		0936:08 F/O localizer's alive on the right	
0935:15 CAM ((sound of landing gear being lowered))		0936:14 CAPT fifteen hundred to ten what we're shootin' for	
0935:17 CAPT when you get three green on the gear go ahead and go fifteen and the checklist		0936:16 F/O okay	
0935:20 F/O okay		<i>0936:18 MRK87 You guys about there</i>	
0935:23 CAM ((sound of slow trim in motion horn))		0936:31 CAPT eh comin' up on ten let's go flaps thirty	
0935:24 F/O fifteen		0936:33 F/O thirty	
0935:27 F/O okay ah shoulder harnesses		0936:35 CAPT complete the checks	
0935:28 CAPT fastened on the left		0936:38 F/O flaps	
0935:29 F/O fastened on the right passenger notification		0936:39 CAPT thirty green light	
0935:31 CAPT complete		0936:40 F/O landing checklist complete	
0935:32 F/O recall		0936:41 CAPT there comes the ten to fifteen hundred — five hundred feet is what we're headed for	
		0936:45 CAPT two point three DME	
		0936:49 CAPT and go ahead and switch the bleeds	
		0936:52 F/O what do I bring them off here	

Intra-Cockpit

Air-Ground Communications

all right

0937:06 CAM ((sound of altitude alert tone))

0937:09 CAPT you can turn the ice back off I don't think it is ever going to get warm enough

0937:12 F/O anti-ice is comin' off

0937:14 CAPT wait I can get some good information out of here

0937:17 CAPT there's a thousand

0937:19 F/O a thousand above the field

0937:21 F/O altimeters and instruments cross checked

0937:22 F/O no flags

0937:42 CAPT go ahead and hit 'em five clicks or whatever for the lights make sure they're on when we come out of the bottom here

0937:44 F/O okay

0937:46 MRK3087 ((sound of seven mike clicks heard on the radio))

0937:49 F/O ground contact

0937:50 CAPT okay

0937:51 F/O oh

0937:51.5 CAM ((sound of impact))

0937:51.7 ((end of recording))

The Safety Board determined that the probable causes of the accident were deficiencies in flightcrew coordination, their failure to adequately prepare for and properly execute the non-precision approach, and their subsequent premature descent.

The transcript of the cockpit voice recorder shows the captain calling out incorrect descent limit altitudes during the approach, even through correct altitudes were discussed by the two pilots during the approach briefing. The board believes that the first officer — who had only 80 hours of turbojet aircraft experience — did not challenge the incorrect call-outs because he either failed to monitor the approach sufficiently or he was hesitant to question the way in which the approach was being flown.

The safety board recommended that MarkAir revise its pilot ground training program so that pilots receive cockpit resource management (CRM) training before participating in line flight operations. CRM programs are specifically designed to enhance pilot/copilot communications.

The NTSB also recommended that the FAA standardize the depiction of instrument approaches on civilian and military charts. Although the board could not determine why the captain descended below the prescribed approach altitudes, it noted differences between the Jeppesen Sanderson approach charts and those printed by the National Ocean Survey (NOS). While the Jeppesen chart was used for this approach, the captain had military experience using the NOS charts, which differ in the presentation of information, such as reference circles and distance rings.

The complete NTSB accident report may be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 U.S. The report should be identified as PB91-910e402. ♦

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