AAIB Bulletin No: 4/95 **Ref: EW/C94/12/2** **Category: 2.1**

INCIDENT

Aircraft Type and Registration:	Bell 214ST, G-BKJD	
No & Type of Engines:	2 General Electric CT7 turboshaft engines	
Year of Manufacture:	1982	
Date & Time (UTC):	6 December 1994 at 1755 hrs	
Location:	Near the Petrojarl 1 - a floating storage vessel in the East Shetland Basin	
Type of Flight:	Public Transport	
Persons on Board:	Crew - 2	Passengers - 15
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Transmission system overtorqued	
Commander's Licence:	Airline Transport Pilot's Licence (Helicopters)	
Commander's Age:	37 years	
Commander's Flying Experience:	6,573 hours (of which 2,895 were on type) Last 90 days - 92 hours Last 28 days - 32 hours	
Information Source:	AAIB Field Investigation	

Background to the incident flight

The flight crew and the helicopter were based at Aberdeen. On the morning of 6 December both were contacted at home by telephone at about 0830 hrs and asked to report for duty. Their task was to fly to Sumburgh Airport where they were to collect 15 passengers and take them to the Petrojarl 1, a floating oil-storage vessel. The unplanned task had arisen because the sea state was such that the movement of the vessel's helideck was outside the limits for the helicopter normally used but within the limits for the Bell 214ST.

Both pilots arrived at their operating base at about 0900 hrs and began preparations for the day's flying. However, a succession of technical problems delayed their departure from Aberdeen until 1530 hrs. The flight to Sumburgh was carried out by daylight in good weather conditions and was uneventful. At Sumburgh the passengers and a small quantity of fuel were embarked which brought the aircraft's all-up weight close to the maximum allowable take-off weight.

The incident flight

The aircraft departed Sumburgh in darkness at 1700 hrs and joined track 'Hotel' for the cruise in generally good VMC but under IFR at 2,000 feet altitude with the co-pilot in the left-hand pilot's seat acting as the handling pilot. En route the crew noticed several small but intense returns on the aircraft's weather radar display which were about one mile in diameter; they were slightly larger than a typical platform return and they had a thin yellow band surrounding the red core area. They did not see any lightning or St Elmo's fire.

At about 1740 hrs the helicopter crew contacted the Petrojarl 1 by VHF radio and were given details of the weather and deck movement, as follows:

Wind direction over the helideck:	Mean direction 300° but varying between 290° and 310°
Wind speed over the helideck:	Mean 28 kt but variable in speed
Visibility:	10 km
Cloud:	5 oktas base at 1,500 feet or higher
Maximum deck pitch and roll:	3.2° and 1.6° respectively
Maximum deck heave and period:	3.7 metres and 8 seconds
Vessel's heading:	258°

As the aircraft got nearer to the Petrojarl, the crew identified the vessel on radar and noticed one bright red return to the north of but close to the vessel. During the first approach the weather radar was switched to standby and the wind appeared to the flight crew to be in line with the vessels heading so the co-pilot retained control. As the aircraft came alongside the vessel on its starboard side, the crew noticed an increase in air turbulence. At about this stage it also became clear that the wind direction was more from their right than they had at first thought which would make it difficult for the co-pilot to execute the landing. Without coming to the hover, the co-pilot abandoned the approach and climbed the helicopter ahead to about 800 feet altitude. He felt slightly uncomfortable during this manoeuvre because of the air turbulence which also affected the aircraft's pitch attitude stability.

Control was exchanged between the pilots on the downwind leg of a left-hand visual circuit. The commander flew a long, gently curving final approach leg which brought the aircraft alongside the vessel's port side. During the early part of this approach he felt that the turbulence was only moderate and as the aircraft approached the helideck, the commander noted from the vessel's windsock that the wind direction was from between 10° and 20° right of the bow. As he brought the aircraft to the hover about 50 feet above helideck level on its port side, the turbulence became very marked and he had difficulty in stabilising the hover because of the air turbulence and helideck motion. At the same time, the co-pilot, who as non-handling pilot was monitoring transmission torque, noticed the strong air turbulence and frequent torque fluctuations.

After assessing the vessel's movement, the commander began to manoeuvre the aircraft towards the helideck whereupon the turbulence and helicopter's movement became violent. At this stage the commander decided that the weather conditions and sea state were too severe for a safe landing and he abandoned the approach. There were no lights ahead of the vessel and no natural horizon cues as the commander began the go-around manoeuvre. As the helicopter climbed away he felt that his control inputs had been positive but the rate of climb was lower than he had expected and the air turbulence increased in severity.

The commander was aware that he was having problems controlling the aircraft and was making unusually large control inputs. He noticed that the airspeed was low and reducing rapidly through 40 kt towards zero; the co-pilot also noticed a rapid reduction in airspeed and commented that the pitch attitude was unusually high. The commander then diagnosed a state of incipient vortex ring and to escape from this condition he pushed forward on the cyclic control but this did not seem to him to have the desired effect of increasing the airspeed. At the same time the co-pilot grasped the controls and both pilots then jointly made a further nose down cyclic input. As the aircraft entered an intentional dive, the commander reduced collective sufficiently to offload the engines but not so far as to enter autorotation. During the dive the commander transmitted a brief 'MAYDAY' message. Next he noticed the surface of the sea illuminated by the landing light and pulled back on the cyclic control to avoid an impact. In the subsequent climb the commander heard an answer to his Mayday transmission and he then cancelled the emergency. The co-pilot continued flying the aircraft whilst the commander contacted the Petrojarl by radio and checked the state of the aircraft. They cleared the area of severe air turbulence within two minutes and set course for Sumburgh where they landed uneventfully at 1854 hrs.

Meteorological aftercast

An aftercast was obtained from the Meteorological Office. The synoptic situation at 1800 hrs showed an unstable westerly airstream established over the East Shetland Basin ahead of a ridge of high pressure approaching from the west. The surface wind was from 290° at 15 to 20 kt with gusts to between 25 and 30 kt; at 2,000 feet altitude the wind was from 250° at 45 kt. The mean sea level pressure was 1002 mb and the visibility was 20 km or more with deteriorations to 10 km in showers of rain or hail. There were scattered clouds with bases between 2,000 and 3,000 feet with occasional towering cumulus or cumulonimbus clouds with bases between 1,000 and 1,500 feet and tops at 25,000 feet. Although no thunderstorms were reported in the area, satellite imagery timed at 1800 hrs showed a cluster of large cumulus or cumulonimbus clouds in the vicinity of the Petrojarl. The aftercast stated that flying conditions were likely to have been very turbulent in close proximity to these large clouds.

Formal investigation

The Chief Inspector of Air Accidents has ordered a Formal Investigation into this incident.