NO 94-027

PIPER PA 32-260

ZK-DDF

WAIHEKE ISLAND

22 DECEMBER 1994

ABSTRACT

On 22 December 1994, Piper PA 32-260 (Cherokee Six) ZK-DDF landed heavily on Waiheke Island Aerodrome. The aircraft sustained wing and undercarriage damage, but none of the four occupants was injured. The causal factor in this accident was the turbulence encountered during the approach and landing phase of the flight. No safety deficiencies were revealed by the investigation.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO 94-027

Aircraft Type, Serial Number and Registration:	Piper PA 32-260, 32-480 ZK-DDF
Number and Type of Engines	1 Lycoming O-540-E4B5
Year of Manufacture:	1967
Date and Time:	22 December 1994, 1205 hours*
Location:	Waiheke Island Aerodrome Latitude: 36° 48' S Longitude: 175° 04' E
Type of Flight:	Air Transport - Scheduled service
Persons on Board:	Crew: 1 Passengers: 3
Injuries:	Crew: Nil Passengers: Nil
Nature of Damage:	Substantial
Pilot in Command's Licence:	Airline Transport Pilot Licence (Aeroplane)
Pilot in Command's Age:	59
Pilot in Command's Total Flying Experience:	13,000 hours 200 on type
Information Sources:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	Mr A J Buckingham

* All times in this report are NZDT (UTC + 13 hours)

1. NARRATIVE

1.1 On 22 December 1994, ZK-DDF was operating a scheduled flight from Auckland International Airport to Waiheke Island Aerodrome with three passengers on board.

1.2 The aircraft had been positioned at Auckland International Airport earlier in the morning, and while on the ground, the pilot had arranged for it to be fuelled to capacity. The Cherokee Six fuel system has four tanks in total, two main tanks in the inboard section of each wing, and two wingtip tanks. Each tip holds 64.3 litres, or about 46 kg of Avgas.

1.3 The flight departed Auckland and proceeded uneventfully to Waiheke Island. The pilot positioned the aircraft on a left-hand base leg for runway 36, which sloped up from the threshold for the first 200m (approximately) of its length, intending to land uphill. The wind was all cross-wind from the left, favouring neither runway 36 nor the reciprocal runway 18.

1.4 During the turn onto final approach, significant turbulence was encountered, but this moderated on the approach. At this stage, according to the pilot, the approach speed was 95mph (82.5 knots), which he considered sufficient to cope with anticipated gusts on the approach. Normal approach speed in no-wind conditions was 80mph (69.5 knots).

1.5 While in the flare, and before it had been yawed to align with the touchdown heading, the aircraft dropped suddenly and landed heavily from an estimated height of six to eight feet. The nosewheel leg failed on touchdown, the aircraft pitched onto its nose and slid some 130 m before stopping. The pilot and passengers vacated the aircraft immediately, none having sustained any injury.

1.6 The propeller was bent as a result of striking the ground when the nosewheel leg failed. The mainwheel legs appeared undamaged, as did the upper wing surface above them, but both wing spars failed downward at a point approximately in line with the outboard end of the flap. The pilot was surprised at the extent of the damage, as he felt that the actual touchdown was not unduly heavy.

1.7 The spar failures probably resulted from the whiplash effect of the mass of the full tip tanks, a known phenomenon in the early models (including ZK-DDF) of the PA 32 series. Later models have a strengthening doubler in the area of the main spar prone to this type of failure.

1.8 The nosewheel leg had failed initially at the fork, as a result of the aircraft's touching down while drift was still applied. With the fork failure and consequent departure of the nosewheel, the resulting drag of the strut on the grass surface of the runway was sufficient to cause it to fail rearward. The firewall in the vicinity of the nosewheel leg mounts suffered some light rippling.

1.9 The wind in the area was north-westerly, the reported strength at Auckland International Airport being 20 knots with gusts to 30 knots, and at Whenuapai, 20 knots. Actual wind strength measurements at Waiheke Island Aerodome were not recorded, but the aerodrome had two wind direction indicators (windsocks), one to the east of the runway mid-point and one near the northern end of the runway. Both of these were visible on final approach down to approximately 50 feet above the threshold, when sight of the northern one was lost because of the slope of the aerodrome. The southern windsock has since been moved closer to the runway 36 touchdown area to give a better perception of the wind at that point.

1.10 Some 500 m to the west of the runway lies a feature known locally as Stony Ridge, which is oriented approximately north-south and has a maximum elevation of 410 feet; the aerodrome elevation is 161 feet. In the prevailing wind conditions, the effect of the ridge would have been to produce local turbulence and downdraughts in its lee, that is, in the vicinity of the aerodrome. Additionally, the effect of the wind "funnelling" around the ends of the ridge was likely to have given rise to tailwind gusts on either approach.

1.11 While securing the aircraft after the accident, the pilot noted that the wind direction was swinging noticeably, and while the general direction was at right angles to the runway, some gusts had significant head or tailwind components.

1.12 The pilot, who was also the aerodrome owner and operator, was familiar with the effects of the local topography on flying conditions. The pilot had been operating from the aerodrome for the past two years, having owned it for a total of nine years, and had experienced conditions worse than those on the day of the accident.

2. FINDINGS

2.1 The pilot was appropriately licensed and experienced.

2.2 The pilot had owned the aerodrome for approximately nine years and was familiar with local conditions.

2.3 The aeroplane was operating normally at the time of the accident.

2.4 The aeroplane had a valid Certificate of Airworthiness and Maintenance Release.

2.5 During the landing flare, the aeroplane encountered either a tailwind gust or a downdraught, causing it to land heavily.

2.6 As a result of the heavy landing, the wings failed downwards, probably because of the whiplash effect of the mass of the tip tank contents.

2.7 At the time of the accident, wind conditions were conducive to the generation of turbulence, downdraughts and gusts with either head or tailwind components in the vicinity of the aerodrome.

21 June 1995

J Fish
Acting Chief Commissioner

GLOSSARY OF AVIATION ABBREVIATIONS

AD	Airworthiness Directive
ADF	Automatic direction-finding equipment
agl	Above ground level
AI	Attitude indicator
AIC	Aeronautical Information Circular
AIP	Aeronatical Information Publication
amsl	Above mean sea level
AOD	Aft of datum
ASI	Airspeed indicator
ATA	Actual time of arrival
ATC	Air Traffic Control
ATD	Actual time of departure
ATPL (A *or* H)	Airline Transport Pilot Licence (Aeroplane *or* Helicopter)
AUW	All-up weight
°C	Degrees Celsius
CAA	Civil Aviation Authority
CASO	Civil Aviation Safety Order
CFI	Chief Flying Instructor
C of G (*or* CG)	Centre of gravity
CPL (A *or* H)	Commercial Pilot Licence (Aeroplane *or* Helicopter)
DME	Distance measuring equipment
E	East
ELT	Emergency location transmitter
ERC	Enroute chart
ETA	Estimated time of arrival
ETD	Estimated time of departure
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration (United States)
FL	Flight level
ft	Foot/feet
g	Acceleration due to gravity
GPS	Global Positioning System
h	Hour
HF	High frequency
hPa	Hectopascals
hrs	Hours

IAS	Indicated airspeed
IFR	Instrument Flight Rules
IGE	In ground effect
ILS	Instrument landing system
IMC	Instrument meteorological conditions
in	Inch(es)
ins Hg	Inches of mercury
kg	Kilogram(s)
kHz	Kilohertz
KIAS	Knots indicated airspeed
km	Kilometre(s)
kt	Knot(s)
lb	Pounds
LF	Low frequency
LLZ	Localiser
Ltd	Limited
m	Metre(s)
M	Mach number (e.g. M1.2)
°M	Degrees Magnetic
MAANZ	Microlight Aircraft Association of New Zealand
MAP	Manifold absolute pressure (measured in inches of mercury)
MAUW	Maximum all-up weight
METAR	Aviation routine weather report (in aeronautical meteorological code)
MF	Medium frequency
MHz	Megahertz
mm	Millimetre(s)
mph	Miles per hour
N	North
NDB	Non-directional radio beacon
nm	Nautical mile
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board (United States)
NZAACA	New Zealand Amateur Aircraft Constructors Association
NZDT	New Zealand daylight time (UTC + 13 hours)
NZGA	New Zealand Gliding Association
NZHGPA	New Zealand Hang Gliding and Paragliding Association
NZMS	New Zealand Mapping Service map series number
NZST	New Zealand Standard Time (UTC + 12 hours)
OGE	Out of ground effect
okta	Eighths of sky cloud cover (e.g. 4 oktas = 4/8 of cloud cover)
PAR	Precision approach radar
PIC	Pilot in command
PPL (A *or* H)	Private Pilot Licence (Aeroplane *or* Helicopter)
psi	Pounds per square inch

QFE	An altimeter subscale setting to obtain height above aerodrome
QNH	An altimeter subscale setting to obtain elevation above mean sea level
RNZAC	Royal New Zealand Aero Club
RNZAF	Royal New Zealand Air Force
rpm	revolutions per minute
RTF	Radio telephone or radio telephony
s	Second(s)
S	South
SAR	Search and Rescue
SSR	Secondary surveillance radar
°T	Degrees True
TACAN	Tactical Air Navigation aid
TAF	Aerodrome forecast
TAS	True airspeed
UHF	Ultra high frequency
UTC	Co-ordinated Universal Time
VASIS	Visual approach slope indicator system
VFG	Visual Flight Guide
VFR	Visual flight rules
VHF	Very high frequency
VMC	Visual meteorological conditions
VOR	VHF omnidirectional radio range
VORTAC	VOR and TACAN combined
VTC	Visual terminal chart
W	West