PAPUA NEW GUINEA

ACCIDENT INVESTIGATION COMMISSION

FINAL REPORT

AIC 22-2001

New Tribes Mission (PNG) Limited

P2-NTE

Quest (Daher) Kodiak 100

In-flight Damage

Approximately 6 NM Northeast of Hoskins Airport, West New Britain

Papua New Guinea

27 April 2022

About the AIC

The Accident Investigation Commission (AIC) is an independent statutory agency within Papua New Guinea (PNG). The AIC is governed by a Commission and is entirely separate from the judiciary, transport regulators, policy makers and service providers. The AIC's function is to improve safety and public confidence in the aviation mode of transport through excellence in: independent investigation of aviation accidents and other safety occurrences within the aviation system; safety data recording and analysis; and fostering safety awareness, knowledge, and action.

The AIC is responsible for investigating accidents and serious incidents and other transport safety matters involving civil aviation in PNG, as well as participating in overseas investigations involving PNG registered aircraft. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The AIC performs its functions in accordance with the provisions of the *PNG Civil Aviation Act 2000 (as amended)*, and the *Commissions of Inquiry Act 1951*, and in accordance with *Annex 13* to the *Convention on International Civil Aviation*.

The objective of a safety investigation is to identify and reduce safety-related risk. AIC investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the AIC to apportion blame or determine liability. At the same time, an investigation report must include relevant factual material of sufficient weight to support the analysis and findings. At all times the AIC endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why it happened, in a fair and unbiased manner.

Capt. Aria Bouraga, MBE

Acting Chief Commissioner

20 June 2023

About this report

On 28 April 2022 at 16:34 local time (06:34 UTC), the AIC was notified by New Tribes Mission Aviation (PNG) Limited (NTMA) via email, of a serious incident[1] involving a Quest (Daher) Kodiak 100 aircraft registered P2-NTE, owned and operated by NTMA at Hoskins, West New Britain. The AIC immediately commenced an investigation. The serious incident occurred at 14:43 on 27 April 2022.

This Final Report has been produced by the AIC P.O Box 1709, Boroko 111, NCD Papua New Guinea. It has been approved for public release by the Commission in accordance with Para 6.5 of ICAO Annex 13. The report is published on the AIC website www.aic.gov.pg.

The report is based on the investigation carried out by the AIC under the Papua New Guinea Civil Aviation Act 2000 (As Amended), and Annex 13 to the Convention on International Civil Aviation. It contains factual information, analysis of that information, findings and contributing (causal) factors, other factors, safety actions, and safety recommendations.

Although AIC investigations explore the areas surrounding an occurrence, only those facts that are relevant to understanding how and why the accident occurred are included in the report. The report may also contain other non-contributing factors which have been identified as safety deficiencies for the purpose of improving safety.

Readers are advised that in accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of an AIC aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the final report is the prevention of accidents and incidents (Reference: ICAO Annex13, Chapter 3, paragraph 3.1). Consequently, AIC reports are confined to matters of safety significance and may be misleading if used for any other purpose.

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1 *Annex 13* to the *Convention on International Civil Aviation* ***defines a serious incident as:*** An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.

Note 1.— The difference between an accident and a serious incident lies only in the result.

TABLE OF CONTENTS

FIGURES

TABLES

GLOSSARY OF ABBREVIATIONS

AGL	: Above ground level
AIC	: PNG Accident Investigation Commission
AMSL	: Above mean sea level
AOC	: Air operator certificate
ATC	: Air Traffic Control
CAR	: Civil aviation rules
CASA	: Civil Aviation Safety Authority of PNG
CPL	: Commercial pilot licence
ETA	: Estimated time of arrival
HF	: High frequency
NM	: Nautical miles
PIC	: Pilot in command
VFR	: Visual Flight Rules
UTC	: Coordinated Universal Time

INTRODUCTION

SYNOPSIS

On 27 April 2022, at about 16:43pm local (06:43 UTC[2]) a Quest (Daher) Kodiak 100 (Kodiak 100) aircraft, registered P2-NTE, owned and operated by New Tribes Mission Aviation (PNG) Limited[3] (NTMA) sustained in-flight structural damage to the left horizontal stabiliser, about 6 nautical miles (NM) northeast of Hoskins Airport. The aircraft was conducting a non-scheduled VFR[4] training flight from Lele Airstrip to Hoskins Airport, West New Britain Province, Papua New Guinea.

There were two persons onboard: the pilot in command (PIC) and a pilot under instruction. No injuries were reported.

About 6NM northeast of Hoskins Airport the aircraft's left upper wing root fairing detached from the aircraft and struck the left inboard leading edge of the left horizontal stabilizer.

The pilots also stated in the interview that after they landed at Hoskins Airport, they did not notice any damage to the aircraft. They first saw the damage the next morning during their routine "before first flight" pre-flight inspection of the aircraft.

The investigation was unable to determine the state of security of the installed left wing upper wing-root fairing following installation after the paint rectification work. Sixteen screws secured the fairing in place and the investigation found that four of the screw threads in the nut plates (three on front edge of the fairing and one on aft inboard section of the fairing at the fuselage) were relatively unworn and not damaged.

Due to the high wing configuration of the aircraft, whether the screws were missing or not securely screwed into place, the error could easily remain undetected from the ground. Therefore, it was not picked up by the person releasing the aircraft to service or other maintenance personnel or subsequent flight crew performing pre-flight inspections.

The *NTMA Pre-flight Checklist* did not include a check of the exterior of the airframe to ensure security of inspection doors, panels and caps, nor does it require flight crew to check on rivets and fasteners of the airframe. It is likely that if the screws were in place but not adequately secured after previous maintenance, the in-service aircraft vibrations and aerodynamic forces could have unfastened them over the time of the aircraft's operation causing them to separate from the nut plates.

The AIC issued *Safety Recommendations* to NTMA with respect to:

- amending their operational and maintenance procedures to include pre-flight inspection requirements for pilots to conduct visual inspections of the exterior of the airframe to ensure security of inspection doors, panels and caps, and airframe rivets and fasteners.
- conducting a review of in-service maintenance standard operating procedures (SOPs) to ensure that maintenance supervisors are fully conversant with the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual*, particularly with respect to on-site supervision.

2 The 24-hour clock, in Coordinated Universal Time (UTC), is used in this report to describe the local time as specific events occurred. Local time in the area of the serious incident, Papua New Guinea Time (Pacific/Port Moresby) is UTC + 10 hours.

3 The CASA Air Operators Certificate and Maintenance Organisation Certificate list the operator as New Tribes Mission Aviation. Accordingly, for consistency this will refer to the operator as New Tribes Mission Aviation (NTMA) unless referring to a specific documents use of the name.

4 Visual Flight Rules: Those rules as prescribed by national authority for visual flight, with corresponding relaxed requirements for flight instruments (Source: The Cambridge Aerospace Dictionary)

1 FACTUAL INFORMATION

1.1. History of the flight

On 27 April 2022, at about 16:43pm local (06:43 UTC[5]) a Quest (Daher) Kodiak 100 (Kodiak 100) aircraft, registered P2-NTE, owned and operated by New Tribes Mission Aviation (PNG) Limited[6] (NTMA) sustained in-flight structural damage to the left horizontal stabiliser, about 6 nautical miles (NM) northeast of Hoskins Airport. The aircraft was conducting a non-scheduled VFR[7] training flight from Lele Airstrip to Hoskins Airport, West New Britain Province, Papua New Guinea.

Figure 1: Overhead view of P2-NTE occurrence flight.

There were two persons onboard: the pilot in command (PIC) and a pilot under instruction. No injuries were reported. The pilot in command (PIC) was the pilot flying and was occupying the left seat. The pilot occupying the right seat was under training and was the pilot monitoring.

According to the Garmin G1000[8] recorded data, the aircraft departed Lele Airstrip for Hoskins Airport at 14:21, tracked West for Hoskins Airport and subsequently climbed to about 8,400 ft AMSL[9].

About 31NM East of Hoskins Airport, the aircraft descended to about 8,100 ft AMSL and maintained that altitude for almost 3 minutes. At 14:37, about 24NM East of Hoskins Airport, the aircraft initiated its descent to Hoskins Airport. During the interview with the AIC, the crew stated that the weather was perfect, with clear blue skies along the route and in the Hoskins area.

5 The 24-hour clock, in Coordinated Universal Time (UTC), is used in this report to describe the local time as specific events occurred. Local time in the area of the serious incident, Papua New Guinea Time (Pacific/Port Moresby) is UTC + 10 hours.

6 The CASA Air Operators Certificate and Maintenance Organisation Certificate list the operator as New Tribes Mission Aviation. Accordingly, for consistency this will refer to the operator as New Tribes Mission Aviation (NTMA) unless referring to a specific documents use of the name.

7 Visual Flight Rules: Those rules as prescribed by national authority for visual flight, with corresponding relaxed requirements for flight instruments (Source: The Cambridge Aerospace Dictionary)

8 G1000 is an integrated avionics system, which consolidated all communication, navigation, surveillance, automatic flight control system, primary flight instrumentation, engine indication, and annunciation systems on two liquid crystal display units (DU) and an audio panel. The G1000 avionics system can store on a data memory card.

9 Above Mean Sea Level

At the time of the occurrence, recorded data captured a vertical descent rate of 974ft per min and an airspeed of about 170kts. Recorded data also showed that at 14:43 the aircraft was descending through 2,900ft AMSL[10] (2,700ft AGL[11]) about 6NM Northeast of Hoskins Airport when the aircraft's left upper wing root fairing detached from the aircraft and struck the left inboard leading edge of the left horizontal Stabilizer.

The video camera[12] time provided by the PIC and G1000 data was synchronised to determine where the upper wing root panel had detached in-flight. A +/- 1 second difference. GPS data from the G1000 data was used to calculate the distance.

The aircraft joined left downwind for Runway 12 at 14:46 and subsequently made a left turn to base and proceeded to final approach. The aircraft landed at Hoskins Airport at 14:48.

The pilots stated during interview with the AIC that they heard a thump sound and felt it through their feet, but while it didn't sound like it was in the cabin, they assumed that it was a life vest containing a small scuba air tank located behind the crew seats. It had fallen over on the floor and they thought that was where the thump came from. The aircraft continued to fly normally.

The pilots also stated in the interview that after they landed at Hoskins Airport, they did not notice any damage to the aircraft. They first saw the damage the next morning during their routine "before first flight" pre-flight inspection of the aircraft.

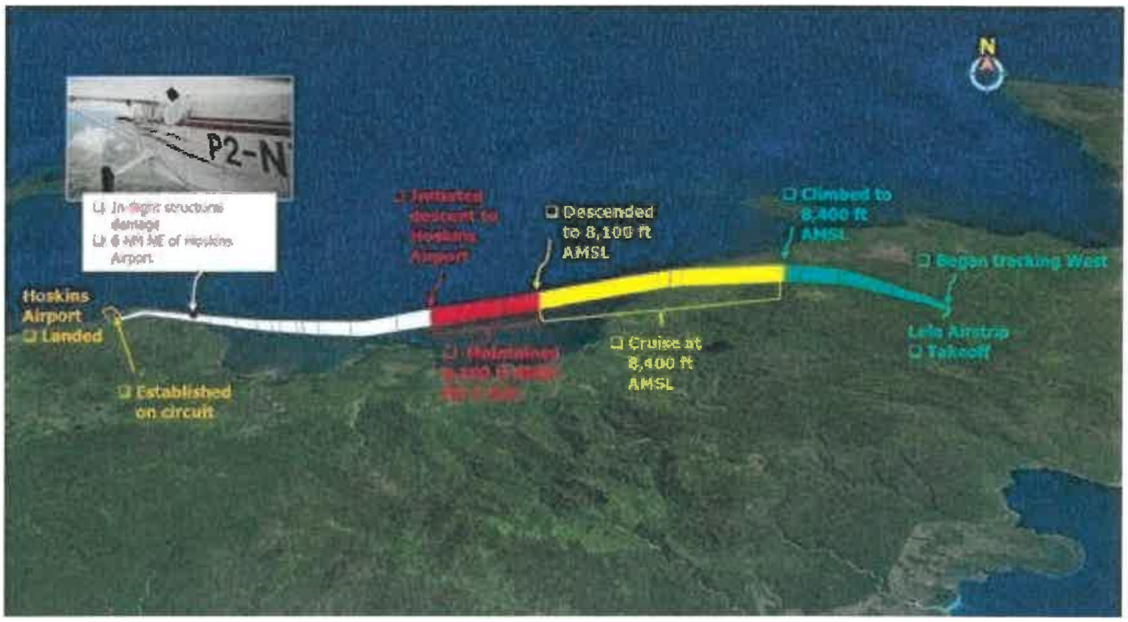

Figure 2: Occurrence flight path with events

The aircraft was fitted with Go-Pro type video cameras on the left wing, tail, and in the cabin. The images from the video recordings were examined by the AIC investigation and were an invaluable source of factual information.

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10 AMSL: Above mean sea level

11 Above Ground Level (AGL). All altitude data obtained from the G1000 recorded data are referenced to Hoskins Airport elevation of 213 ft.

12 The aircraft was fitted with Go-Pro type video cameras on the left wing, tail, and in the cabin. The images from the video recordings were examined by the AIC investigation and were an invaluable source of factual information.

1.2 Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	2	-	2	Not applicable
TOTAL	2	-	2	-

Table 1: Injuries to persons

1.3 Damage

The aircraft sustained the loss of the left upper wing-root fairing that attaches to the leading-edge fairing but did not sustain wing, fuselage, or leading-edge fairing damage. There was significant damage to the inboard leading edge of the left horizontal stabilizer. See *Section 1.12* for detailed information.

1.4 Other Damage

There was no other damage to property and/or the environment.

1.5 Personnel Information

1.5.1 Pilot in Command (Left seat)

Age	: 40 years
Gender	: Male
Type of licence	: CPL(A)
Valid to	: Perpetual
Ratings	: Instructor
	: Cessna 206, Quest Kodiak 100
Total flying time	: 2,999.2 hours
Total on this type	: 2,037.8 hours
Total last 90 days	: 138.7 hours
Total on type last 90 days	: 138.7 hours

Total last 7 days	:	7.4 hours
Total on type last 7 days	:	7.4 hours
Total last 24 hours	:	4.6 hours
Total on the type last 24 hours	:	4.6 hours
Total on duty last 48 hours	:	8.5 hours
Total rest period(s) last 48 hours	:	15.0 hours
Medical class	:	One
Valid to	:	15 August 2022
Medical limitation	:	Nil

1.5.2 Pilot under training (right seat)

Age	:	33 years
Gender	:	Male
Type of licence	:	CPL(A)
Valid to	:	Perpetual
Rating	:	Quest Kodiak 100
Total flying time	:	1,644.3 hours
Total on this type	:	227.5 hours
Total last 90 days	:	100.4 hours
Total on type last 90 days	:	100.4 hours
Total last 7 days	:	6.9 hours
Total on type last 7 days	:	6.9 hours
Total last 24 hours	:	4.6 hours
Total on the type last 24 hours	:	4.6 hours
Total on duty last 48 hours	:	8.5 hours
Total rest period(s) last 48 hours	:	15.0 hours
Last proficiency check	:	14 April 2022
Route recency	:	14 April 2022
Aerodrome recency	:	14 April 2022
Medical class	:	One
Valid to	:	24 March 2023
Medical limitation	:	Nil

1.5.3 Maintenance Manager

The personal records of the Maintenance Manager showed that he was appropriately licensed and authorised. His licence was reissued on 29 March 2021. The initial issue was on 22 July 2002.

The Maintenance Manager was licensed on the following categories relevant to the Kodiak 100 aircraft:

Aeroplane Category

Group 1-Metal Skin, unpressurised <5,700kg, fixed landing gear.

Powerplant Category

GP2-Turbine, Supercharged & Radial Piston Engines.

The Maintenance Manager also had a company authorisation issued on 19 May 2022.

1.5.4 Maintenance Controller

The personal records of the Maintenance Controller showed that he was appropriately licensed and authorised. His licence was issued on 05 July 2017.

The Maintenance Controller was licensed on the following categories relevant to the Kodiak 100:

Aeroplane Category

Group 1-GP1-Metal Skin, unpressurised<5,700kg, fixed uc.

Powerplant Category

GP2-Turbine, Supercharged & Radial Piston Engines

The Maintenance Controller also had a company authorisation issued on 12 November 2021.

1.5.5 Licenced Aircraft Maintenance Engineer (LAME)

The records reviewed indicated that all three Licensed Aircraft Maintenance Engineers who had signed off tasks in the *Work Order* for the inspection and maintenance performed on P2-NTE were appropriately authorised and licensed.

1.5.6 Aircraft Maintenance Engineer (AME)

According to the operator's roster for the unlicensed Aircraft Maintenance Engineers (AME), an experienced AME was assigned to the Wings for the 300hr, 400hr, 800hr inspections and was involved in the painting job. The AME was licensed in his home country but was not licensed in PNG.

The AIC reviewed the records for the AME and found that he was issued an appropriate *Company Authorisation Certificate* on 19 May 2022 in accordance with the NTMA *Maintenance Organisation Manual*.

The investigation also found that the AME had been in PNG for a few months and was trained on the Kodiak 100. He informed the AIC that his experience on the Kodiak 100 started in PNG and that he was not a professional of Turbo Propeller Engine aircraft.

He was authorised on the following:

Description	**Issue Date**	**Currency Expiry Date**
Designated Special Operations	19 Nov 2021	19 Nov 2023
Aircraft Maintenance Engineer	19 Nov 2021	19 Nov 2023
Duplicate Inspection	19 Nov 2021	19 Nov 2023
Engine Ground Run	18 May 2022	18 May 2024
Outward Issue of Stock from Stores	19 Nov 2021	19 Nov 2023
Aircraft Ground Handling	19 Nov 2021	19 Nov 2023
Aircraft Role Equipment Removal/Installation	19 Nov 2021	19 Nov 2023
Aircraft Fueling/Defueling	19 Nov 2021	19 Nov 2023

Table 2: AME Company authorisations

1.6 Aircraft

1.6.1 Aircraft Data

Aircraft manufacturer	: Quest (Daher) Aircraft Company, LLC
Model	: Kodiak 100
Serial number	: 100-0111
Year of manufacture	: February 2014
Nationality and Registration Mark	: PNG, P2-NTE
Total hours since new	: 2,621.2
Total cycles since new	: 3,481
Certificate of Registration number	:387
Certificate of Registration issued	: 29 April 2016
Name of the Owner	: New Tribes Mission Aviation
Name of the Operator	: New Tribes Mission Aviation
Certificate of Airworthiness number	: 387
Certificate of Airworthiness issued	: 26 April 2016
Certificate of Airworthiness valid to	: Non-Terminating

1.6.2 Engine

Engine Type	: Turbo Propeller
Manufacturer	: Pratt & Whitney Canada
Model	: PT6A-34
Serial number	: PCE-RB0756

Engine data is not relevant to this serious incident

1.6.3 Propeller

Manufacturer	: Hartzell Propeller
Model	: HC-E4N-3PY
Serial number	: HH5199

Propeller data is not relevant to this serious incident

1.7 Meteorological information

1.7.1 Terminal Aerodrome Forecast

The amended Terminal Aerodrome Forecast (TAF) Number 2 for Hoskins was issued by the PNG National Weather Service on 27 April 2022 23:19UTC and was valid from 23:00UTC to 09:00UTC.

The prevailing meteorological conditions were not a factor in the serious incident.

Wind	Variable at 3 kts
Visibility	Greater than 10 km in light showers and rain
Cloud	Scattered at 1700ft Scattered at 13000ft
QNH	1007, 1005 and 1006 hPa

Table 3: Hoskins *Terminal Aerodrome Forecast*

1.7.2 Area 9 Forecast

The Area 9 forecast was valid from 23:00UTC to 11:00UTC.

Overview	Scattered showers and thunderstorms with rain areas.			
Upper winds	7000ft	10,000ft	14,000ft	18,500ft
	100 degrees at 15 kts	120 degrees at 10 kts	140 degrees at 10 kts	160 degrees at 10 kts
Cloud	Isolated cumulonimbus base 1800ft tops 45,000ft	Broken stratus base 500ft tops 3000ft in precipitation	Scattered cumulus base 1500ft tops 10,000ft in broken showers. Scattered stratocumulus base 3000ft tops 3000ft in broken rain and drizzle. Scattered altocumulus altostratus base 10,000ft tops 18,000ft	
Visibility	500m in fog 300m in thunderstorms and rain 4000m in showers rain and rain drizzle.			
Weather	Fog, thunderstorms with rain. Showers of rain. Rain drizzle.			
Freezing levels and icing	Freezing Level 15,000ft	Ice Severe cumulonimbus. Moderate incorporated above freezing level		
Turbulence	Severe in vicinity of cumulonimbus	Moderate adjacent mountains associated with cumuli form		

Table 4: ***Area 9 Forecast***

1.8 Aids to navigation

Ground-based navigation aids / onboard navigation aids / aerodrome visual ground aids and their serviceability were not a factor in this serious incident.

1.9 Communications

Communications between ATS and the crew and the serviceability of radio equipment were not factors in this serious incident.

1.10 Aerodrome information

Neither the departure aerodrome nor the destination aerodrome were factors in this serious incident.

1.11 Flight recorders

The aircraft was not fitted with a flight data recorder or cockpit voice recorder. Neither recorder was required by current PNG aviation legislation.

1.11.1 Electronic flight instrument system (EFIS)

The aircraft was fitted with a Garmin G1000 integrated avionics system. The G1000 records the primary instrument display data and engine parameters at an interval of 1 second on a flight data log memory card. The recorded data of the accident flight was downloaded from the memory by the Operator and provided to the AIC. The data was used by AIC to complement the investigation.

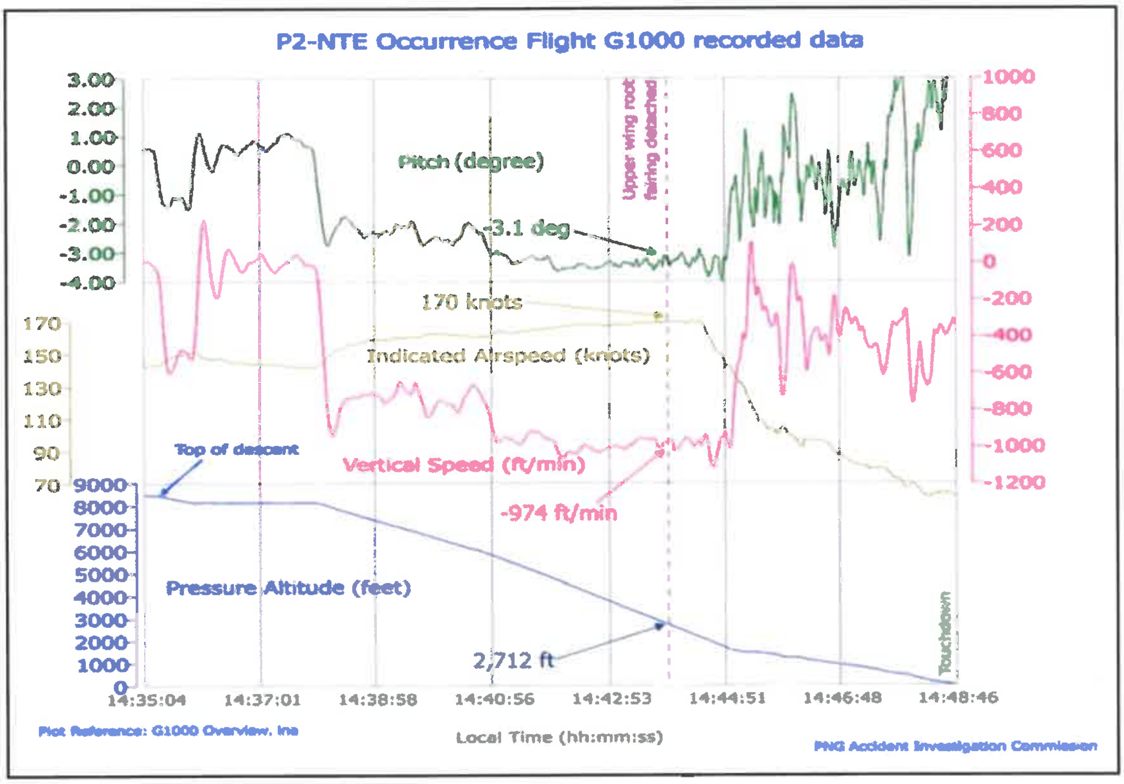


Figure 3: G1000 recorded parameters data plot of the accident flight

1.11.2 Airborne video recorders

The aircraft was fitted with Go-Pro type video cameras on the left wing, tail, and in the cabin. The images from the video recordings were examined by the AIC investigation and were an invaluable source of factual information.

1.12 Wreckage and Impact Information

The aircraft landed safely at Hoskins Airport. All damage to the aircraft was caused by the left upper wing-root fairing separating from the airframe and impacting the left tailplane.

The left upper wing-root fairing that detached from the aircraft in-flight is fastened to the wing and airframe fuselage using screws which thread into nutplates. During the investigation examination, it was observed that the leading-edge fairing remained intact, while the left-upper wing-root fairing detached from the aircraft. (Refer to *Figures 4 and 5*.)

A replacement left-upper wing-root fairing for P2-NTE was taken from the same aircraft type which was undergoing maintenance in Goroka and taken to Hoskins after the incident and fitted to the aircraft. The aircraft was then flown back to Goroka the next day, 28 April 2022.

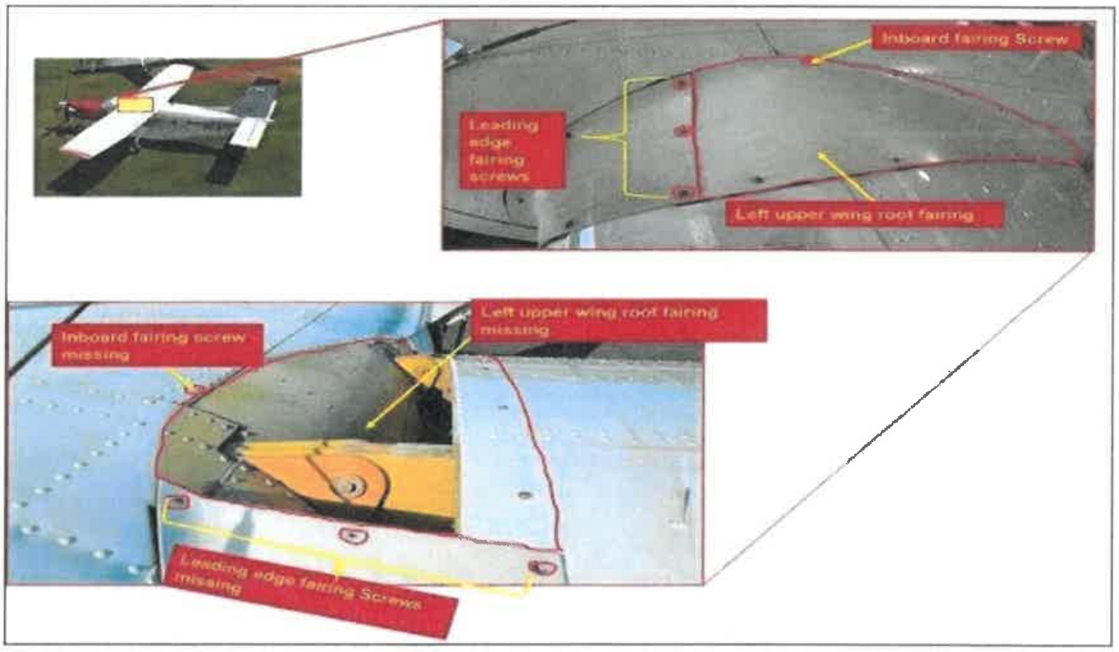


Figure 4 : Overview of damage sustained.

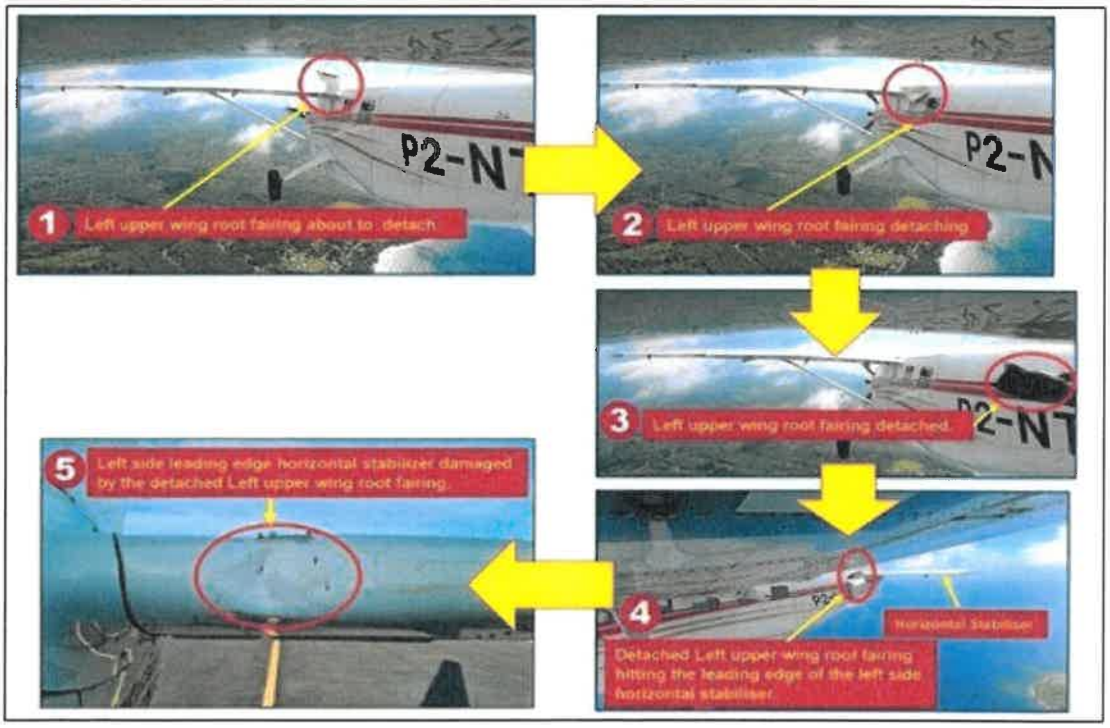


Figure 5: Screenshot of video footage (Pics 1-4) of aircraft on descent showing a detached Left Upper Wing-Root Fairing and damaged left inboard leading edge of Horizontal Stabilizer (Pic 5)

1.13 Medical and Pathological Information

No medical or pathological investigations were conducted as a result of this serious incident, nor were they required.

1.14 Fire

There was no evidence of fire in flight or after the aircraft landed.

1.15 Survival Aspects

This section is not applicable.

1.16 Tests and Research

No tests or research were required to be conducted as a result of this serious incident.

1.17 Organisational and Management Information

1.17.1 Aircraft Owner and Operator: New Tribes Mission Aviation Limited

New Tribes Mission Aviation (NTMA) headquarters is located at Goroka, Eastern Highlands Province. NTMA conducts non-scheduled passenger and cargo flights between approved aerodromes and any point outside of Papua New Guinea where approval has been granted.

The Civil Aviation Safety Authority of PNG issued NTMA an *Air Operator's Certificate (AOC) number 119/019* on 18 December 2020 with an effective date of 31 January 2021 pursuant to *sections 47 (3)* and *49* of the *PNG Civil Aviation Act 2000 (as amended)* and *PNG Civil Aviation Rule (CAR) Part 119.9,* which authorises NTMA to perform commercial air operations in accordance with its expositions and *CAR Parts 135/136 (Rotary Wing).*

The *AOC* states that it expires if the holder ceases to be authorised to conduct air transport operations by CASA or at the end of 31 January 2024 whichever happens first.

The following aircraft types are operated by NTMA: Quest (Daher) Kodiak 100 fixed-wing aircraft, and Bell 206L1 and Robinson R66 helicopters.

The Civil Aviation Safety Authority of PNG issued NTMA a *Maintenance Organisation Certificate (MOC)* on 12 April 2022 that expires on 31 January 2024. The NTMA maintenance organisation is based at Goroka Airport, Eastern Highlands Province and is approved to conduct maintenance on Quest (Daher) Kodiak 100 and Cessna 208 series fixed-wing aircraft, and Robinson R66 and Bell 206L-1 series helicopters. The *MOC* also authorises NTMA to conduct component maintenance of aircraft engines and propellers in accordance with limitations listed in the NTMA *Maintenance Organisation Manual.*

1.17.2 Maintenance Practice

The AIC found that NTMA has an approved maintenance organisation. It maintains a *Maintenance Control Manual*, a *Maintenance Organisation Manual* and appropriate forms and checklists that comply with the Manufacturers maintenance requirements and the PNG Civil Aviation regulatory requirements .It also has access to the *Manufacturers Maintenance Manual*.

The Operators *Maintenance Control Manual, Section 1.4, Post-Maintenance Records Check* states:

1.4.1 Purpose To ensure maintenance specified to be done is accomplished accurately and fully to the standards required by this manual prior to the return of aircraft or components to service.

1.4.2 Scope This procedure applies to all maintenance performed on NTM PNG aircraft and associated components.

The operator's *Maintenance Organisation Manual, Section 8.1, Maintenance Supervision and Coordination* states:

8.1.1 Purpose: To ensure that the maintenance conducted by NTM Aviation is effectively coordinated and supervised.

8.1.3 Responsibilities

8.1.3.1. The Chief Executive shall ensure that this procedure continues to reflect the way NTM Aviation controls maintenance.

8.1.3.2. The Maintenance Manager shall assign appropriately trained and authorized personnel to coordinate and conduct maintenance.

8.1.3.3. The Maintenance Controller shall coordinate maintenance activities and certify accordingly.

8.1.4 Definitions

8.1.4.1. Unless otherwise stated, throughout this Section of the Exposition, the term maintenance encompasses routine inspections of aircraft or components and defect rectification.

8.1.6 Procedure

8.1.6.1. Control / Oversight

8.1.6.1.1 Maintenance tasks are allocated to engineering staff by the Maintenance Manager. All maintenance shall be carried out by persons authorized to do so and shall be supervised by appropriately authorized persons.

8.1.6.1.2 The objective of supervision is to ensure acceptable engineering techniques, practices and approved data are being applied correctly.

8.1.6.1.3 Persons authorized to supervise shall ensure that supervision is achieved by personal physical presence through being on site or in the immediate vicinity of the work being carried out. Engineers and tradesmen being supervised shall ensure they clearly understand at what stage, and under what circumstances, they must consult the supervisor.

The NTMA *Maintenance Organisation Manual, Section 8.3, General Maintenance* states:

8.3.1 Purpose: To give an overview of the general base and line maintenance procedures used by NTM Aviation Authorized Maintenance Center (AMC).

8.3.2 Scope: This procedure applies to scheduled and unscheduled maintenance conducted on NTM Aviation aircraft and any base or line maintenance provided to another operator.

8.3.3 Responsibilities

8.3.3.1. The Maintenance Manager shall ensure that all engineering personnel comply with this procedure.

8.3.3.2. Individual engineers shall ensure that they conduct base maintenance in accordance with this procedure.

Cognisant of the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual,* particularly with respect to on-site supervision, the AIC was concerned when maintenance engineers informed the investigation that it was standard practice that once unlicensed aircraft maintenance engineers (AMEs) are trained, work assigned to them by the Job Coordinator is not necessarily inspected by a Licensed AME (LAME).

1.18 Additional Information

1.18.1 Left upper wing root fairing

The aircraft wing-root fairings are fiberglass. The primary function of the fairings on the aircraft is to reduce drag across the aircraft and to allow a more streamlined flow of air across certain aircraft surfaces (Refer to *Figures 4 and 5*.)

The upper wing-root fairings are detachable components, designed to allow access to the aircraft structure and other maintenance inspection activities related to fuel tank and fuel lines.

The fairings are fastened to the wing root, fuselage, and leading-edge fairing by threaded screws. Sixteen fastening screws hold each upper wing-root fairing in place.

The left upper wing-root fairing separated from the wing in flight. A post-occurrence inspection found that four of the 16 attachment screws were missing. Three of the missing screws were from the aft flange of the leading-edge fairing where the leading-edge of the wing-root fairing is fastened over the aft edge of leading-edge fairing. The other missing screw was from the inboard section of the wing-root fairing which is fastened to the fuselage frame.

The remaining 12 screws found still secured to the aircraft were from the wing-root fairing's wing and fuselage attachment points.

Figure 6: Screws missing from locations circled in red.

1.18.2 Material Composition and Specifications

1.18.2.1 Fairing

According to *Kodiak 100 Structural Repair Manual (SRM),Chapter 53 Fuselage 5350.1 A* and B;

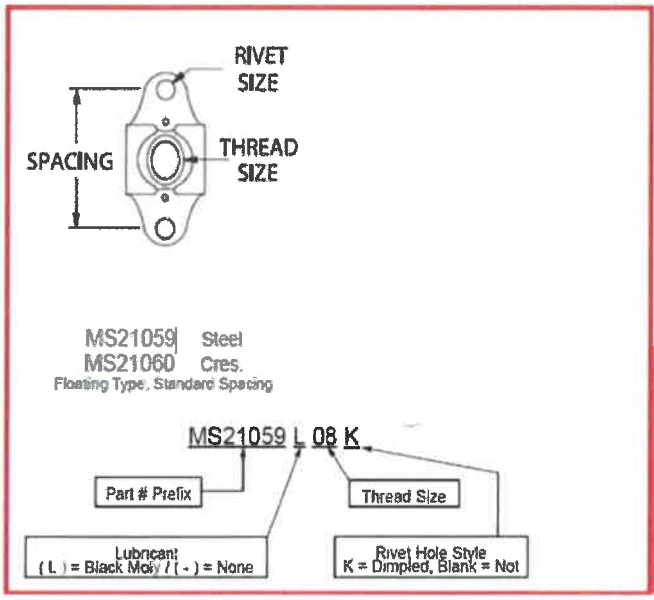
A. The external aerodynamic fairings include the wing, horizontal and vertical tip caps, the tai cone, wing root fairings, and control rod covers.
B. All composite external aerodynamic fairings are non-structural items and are fabricated from woven fiberglass cloth type "E" style 7781 conforming to MIL-C-9084, Type VIII A with proper finishes for resin systems used.

(Refer to *Section 5.1, Appendix A.*)

1.18.2.2 Nut plates

The nut plates where the screws were missing were found to be undamaged during post incident inspection of the aircraft in Hoskins. During the post-incident maintenance, the screws were installed into each nut plate and evaluated for sufficient grip. At that time no nut plates were changed.

The operator stated that the evaluation of the nut plate serviceability was not specifically recorded and that it is the general practice in accordance with *Kodiak 100 Aircraft maintenance Manual, Section 1430 (5 & 10) 'Torque Data'.*



Rivet Spacing Chart "A"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 10-32	.688
1/4-28 Thru 3/8-24	1.00

Figure 7: Nut plate specifications.

The manufacturer stated in an email to the operator that the nut plate Part number (P/N) is not currently listed in the *Illustrated Parts Catalogue (IPC).* The information on the nut plate specifications was taken from the *Genuine Aircraft Hardware Catalog, pages 171 to 173* and provided to the AIC.

According to the *Visual Identification Chart in the Genuine Aircraft Hardware Co, Toolbox Reference Book*, referenced by the Operator, the nutplates are made of Steel and plated with Cadmium 11 / Black Moly.

(Refer to *Sections 5.5 to 5.6, Appendices E and F.*)

1.18.2.3 Fasteners/Screws

Three (3) screws from the leading-edge rear flange and one screw from the aft inboard section were missing.

According to the *Visual Identification Chart in the Genuine Aircraft Hardware Co, Toolbox Reference Book*, referenced by the Operator, the missing screws are AN525 8-32R7 and made of Alloy Steel and 'x' on head, plated with Cadmium 11 or zinc 11 (Gold in appearance). (Refer to *Section 5.3 Appendix C.*)

Screws are either Fine or Coarse threaded. The AN525 832R7 screw is a course threaded screw with a greater pitch (more space between each thread). The fine threaded screw has smaller pitch (less space between each thread).

Fine threaded screws are less susceptible to working loose due to vibration than coarse threaded screws.

Figure 8: Sample of AN525 8-32R7 screw.

Industry Standard or Certification	Thread size	Length	Grip	Thread type	Material	Head Type
AN525	8-32	7/16	1/16	Coarse	Steel Alloy, Cadmium II Plated Steel	Washer Head, Structural Screw

Table 5: 8-32R7 Screw specifications.

1.18.2.4 Maintenance/Airworthiness

The aircraft had a valid *Certificate of Airworthiness*, and the *Annual Airworthiness Review* was current at the time of the occurrence.

Maintenance records showed that the 300hr, 400hr, 12 Month/800hr maintenance inspections were combined. The operator informed the AIC that the inspections were combined to ensure the inspections were completed within 12 months.

The investigation found that after the 300hr, 400hr, 800hr inspections, the aircraft was grounded for a few weeks waiting for a replacement Throttle Quadrant. While waiting for the part they carried out maintenance on additional deferred discrepancies.

Multiple areas of the aircraft exterior required touch-up painting (*Deferred Maintenance-Reference # NTMX21003-Top of LH wing missing large area of paint)*. The left wing upper and lower wing-root fairings were reportedly removed for the painting to be facilitated. The removal of these fairings was not recorded in any maintenance document. When asked by the AIC about the activities associated with the paint job, the operator stated that they had to remove these fairings to allow access to properly paint the wing.

According to the operator's *Maintenance Control Manual, Section 3.4, Deficiency Control and Defect Rectification,* deficiencies[13] arising during scheduled maintenance will be entered and cleared on the *Additional Worksheet, Form NT418.*

The operator's *Additional Worksheet* or *Discrepancy Form* for *Work Order Number 22016* listed some discrepancies that were identified during scheduled maintenance were rectified and signed off on 4 April 2022.

The investigation established that the 100hr progressive inspections, which include check items to verify that the wing surface rivets and screws were fastened and secure were completed and were certified on 4 April 2022. The maintenance personnel informed the AIC that the paint work and associated facilitation tasks and subtasks were deferred maintenance. Records reviewed indicated that the painting job was progressively carried out over the period between the 21 February 2022 and 4 April 2022. The maintenance personnel stated that, during that time, the left upper wing-root panel was removed and reinstalled a few times.

Engineers informed the AIC that pilots reported that during flights through rain, one Kodiak 100 P2-NTZ had rainwater issues with water leaking into the cockpit through the top of the windshield frame and running down into the avionics panel and dripping down onto the centre console.

The operator stated that because P2-NTZ was grounded for unscheduled maintenance (replacement of the windshield), a 300hr scheduled inspection was carried out at that time. The operator's *Work Order Number 22025* showed that the work order for P2-NTZ was opened on 2 April 2022 and closed on 25 May 2022. The maintenance team had to complete maintenance activities on P2-NTE (occurrence aircraft) earlier than planned to enable NTMA to meet their schedule requirements for the fixed-wing aircraft fleet on 5 April 2022.

The maintenance records show numerous signoffs on 4 April 2022. These included the 100-hr progressive, 800hr and deferred maintenance. Among these signoffs was the signoff signifying the completion of the paint job.

---

[13] 3.4.5.1.1. The term "deficiency" as used in this Exposition shall mean a flaw in an aircraft or component whose condition has not been assessed yet; may or may not be serviceable.
3.4.5.1.2. The term "defect" as used in this Exposition shall mean an item not fit for flight operations.
3.4.5.1.3. The term "discrepancy" as used in this Exposition shall mean a known, inspected, and processed flaw not affecting airworthiness of the aircraft.

The 100-hr progressive inspection checklist sign off also included, as a checklist item, the wings which required inspecting for loose rivets and fasteners, corrosion, cracks, wrinkles, and dents. The check items were signifying that the inspection had been successfully completed and that the components secure and were properly inspected.

Work Order number 22016 was opened on 21 February 2022, and it was closed when the aircraft was released to service on 4 April 2022. *The Airframe Logbook* showed that an operational check flight was completed on 5 April 2022 to check flight controls that were changed.

The serious incident occurred at 2,617.1hrs (AFTT) as per the operator's *Daily Flight Log Number 220427E1AYHK*. The aircraft had logged 32.8hr after the completion of the 300hr, 400 hr and 800hr progressive inspections up to the completion of the occurrence flight.

The maintenance record was completed in accordance with *CAR Part 43.68 (5d)*. Dates for actual work carried out (painting of the aircraft) were not entered due to the painting job being carried out progressively. There were no maintenance record entries regarding the paint task and associated sub-tasks. The only records supplied to the AIC by NTMA pertaining to the painting job showed the *Work Order 22016* opened on 21 February 2022 at 2,584.3hrs total airframe time, 3.4hrs prior to the 300hr inspection due time.

1.18.2.5 Procedures on the Removal and Installation of the Wing Root Upper and Lower Fairing Panel

The investigation determined that the wing-root upper and lower fairings had been removed to facilitate painting on multiple areas of the aircraft exterior that required touch-up paint. The *Kodiak 100 Maintenance Manual, Section 5700.5.1 (A,4) (B,15) 'Wing Removal and Installation'* provides the procedures on wing root fairing removal and installation.

> A,4. Remove the wing root upper and lower fairing assemblies by removing their attaching hardware
>
> B,15. Install the upper and lower wing root to fuselage fairing assemblies.

1.18.2.6 Procedures on how to thread the screws into nut plates

The AIC identified that there are no specific procedures on how the screws are threaded into the nut plates for the upper wing-root fairing.

The operator's *Kodiak 100 Aircraft Maintenance Manual, Section 1430 Torque Data* provides general guidance on how to thread the screws into the nut plates. There is no specific torque value.

> 5. Thread Engagement:
>
> A threaded fastener that is properly installed must have a minimum of one full thread showing beyond the edge of the nut, additionally the fastener must be capable of being torqued to the specified value without "bottoming-out" the threads.
>
> 10. Screws attached to nut plates, or screws with threads . . . should be tightened firmly, but not to a specified torque value.

These general principles are used as guidance for the operator's engineers. The operator stated that when the panel is installed, screws are first threaded by hand into each nut plate to ensure they do not bottom out with finger pressure applied, then they are all tightened fi

1.18.2.7 Progressive Inspection

CASA PNG *Advisory Circular 43-1 Progressive inspection* programmes states:

> Progressive inspection programmes are a particular type of maintenance programme. A progressive inspection programme is one where the inspection of the complete aircraft is split into a number of smaller checks. This allows quicker turnaround of the aircraft and assists in scheduling and utilisation.
>
> At each of these small checks, a routine inspection of the complete aircraft is carried out. This usually entails a visual inspection but without disassembly or removal of access panels. At the same time, a detailed inspection is carried out of a particular section, or zone, of the aircraft, such as wings, engine, fuselage, and so on. This detailed inspection is an in-depth inspection including such disassembly and testing as is necessary to ensure that that section or zone meets the requirements of the schedule.

According to NTMA maintenance program for the progressive maintenance, inspections are due each 100hrs. If the accumulated annual flight time does not cycle through a complete progressive inspection schedule at the end of the 12-month period, all remaining progressive inspection items must be completed before the 12-month period expires.

1.18.2.8 Pre-flight inspection

The investigation found that the *NTMA Pre-flight Checklist* did not include a check of the exterior of the airframe to ensure security of inspection doors, panels and caps, nor does not require flight crew to check on rivets and fasteners of the airframe.

The aircraft manufacturer's *Kodiak 100 Series Pilot Operating Handbook, NORMAL PROCEDURES, 4-20 AMPLIFIED PROCEDURES, PREFLIGHT INSPECTION,* dated 31 August 2009 included a paragraph:

> To prevent inadvertent loss of fuel in flight, ensure the fuel tank filler caps are tightly sealed following visual checks of the fuel quantity or servicing.

While this serious incident was not fuel or fuel system related, NTMA pilots were conducting pre-flight checks following the maintenance and subsequent pre-flight inspections between 4 and 27 April 2022 which did not detect any anomaly with the fitment and securing of the wing root panel.

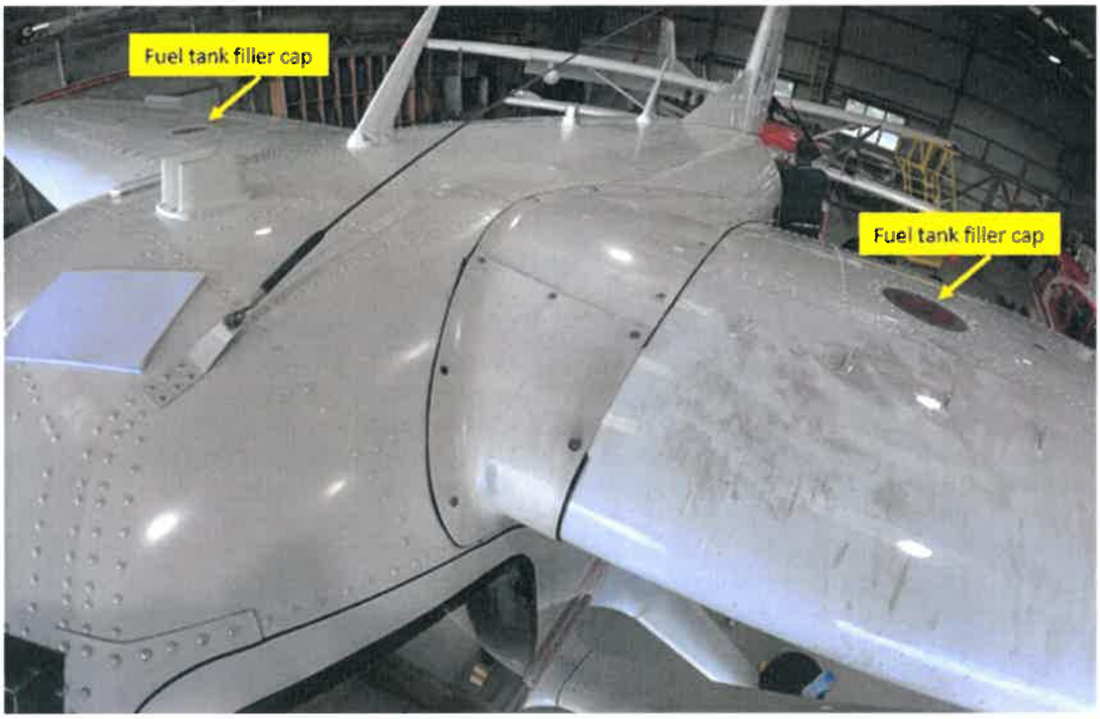


Figure 9: Over wing view showing fairings and fuel tank caps

1.19 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with PNG Civil Aviation Act 2000 (as amended) and Civil Aviation Rules, and PNG Accident Investigation Commission approved policies and procedures, and in accordance with the *Standards and Recommended Practices* of *Annex 13* to the Convention on International Civil Aviation.

2 ANALYSIS

2.1 General

The analysis section of this report discusses relevant facts that contributed to the serious incident. The incident did not have a single causal factor. There were several conditions, both active and latent, that contributed to the outcome of the serious incident. The analysis will therefore focus on the following issues, but not necessarily under separate headings:

- Maintenance
- Flight Operations
- Organisational factors
- Human factors

2.2 Maintenance practice

The AIC found that to facilitate touch-up painting on the aircraft exterior, specifically the wing, the upper and lower wing root fairings had to be be removed. The maintenance team stated that they could not recall when, and how many times, they had removed and installed the fairings but confirmed that they carried out those actions a few times between 21 February 2022 and 4 April 2022.

The investigation determined that there was a lack of on-site supervision and oversight during the maintenance.Cognisant of the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual,* particularly with respect to on-site supervision, the AIC was concerned when maintenance engineers informed the investigation that it was standard practice that once unlicensed aircraft maintenance engineers (AMEs) are trained, work assigned to them by the Job Coordinator is not necessarily inspected by a Licensed AME (LAME). Refer *Section 1.17.2.*

The investigation was unable to conclusively determine the state of security of the installed left upper wing-root fairing following installation after the paint rectification work. Sixteen screws secured the fairing in place and the investigation found that four of the screw threads in the nut plates (three on front edge of the fairing and one on aft inboard section of the fairing at the fuselage) were relatively unworn and not damaged.

The aircraft had completed 32.8hrs of flight time over numerous sectors between 4 April 2022 (post-maintenance) and 27 April 2022, the date of the serious incident. Evidence from the onboard video camera footage showed the fairing lifting in the airflow and the fairing folding back and tearing off, leaving 12 of the screws in their nut plates.

The investigation therefore concluded that four fastening screws, three at the airflow critical front edge of the fairing may not have been installed or they may have been threaded by hand into each nutplate, but not appropriately tightened during the last maintenance and dislodged during subsequent flights. In-flight airflow and vibrations including those sustained during takeoffs and landing on unpaved rural airstrips would have been sufficient for those screws to work lose and dislodge due to vibrations.

2.3 Records

The investigation verified that NTMA had maintenance recording procedures, logbooks, and forms that were compliant with the requirements of the aircraft manufacturer, and *Civil Aviation Rule Part 43*.

The aircraft logbooks and *Work order 22016* showed a deferred maintenance activity.

The investigation found that between the commencement of the paint job work up to the date of sign-off on 4 April 2022, there was no record of associated activities, tasks, or subtasks, i.e. there were no records to show that the fairings were removed and re-installed.

No further maintenance or inspections were carried out on P2-NTE after it was released to service on 4 April 2022.

2.4 Inspections

The investigation established that the 100hr progressive inspection checklist form was completed and the aircraft was released to service on 4 April 2022.

However, it is likely that safety checks were not carried out adequately to the areas that were not visible to access during the safety check by the Engineer assigned to carry out the task, the Engineer who signed and released the aircraft to service and the pilot who carried out the Operational flight check.

The checklist item on the 300, 400, 800-hr progressive inspection form was checked as satisfactory without an adequate inspection being completed for loose or missing screws.

The investigation found no evidence that an inspection was conducted to verify that all work had been carried out fully and correctly following the paint work.

2.5 Human Factors

The AIC established that due to the high wing configuration of the aircraft, whether the screws were missing or not securely screwed into place, the error could easily remain undetected. The screws on the panel would not have given the appearance from the ground that screws were not securely tightened or even missing. Therefore, it was not picked up by the person releasing the aircraft to service or other maintenance personnel.

A last line of defence would be the pilot or other personnel observing that screws were loose or missing from the left-wing upper wing-root fairing when refuelling the aircraft via the over-wing fuel port. Furthermore, when the pilot was conducting pre-flight checks following the maintenance, a check that the over-wing fuel tank caps were secured would have provided opportunity to scan the upper wing panels for security. The security status of the upper wing-root fairing was not observed during the post-maintenance pre-flight inspection or subsequent pre-flight inspections between 4 and 27 April 2022. The NTMA pre-flight checklist does not require flight crew to check the security of rivets, screws and fasteners of the airframe.

It is likely that if the screws were in place but not adequately secured, the in-service aircraft vibrations and aerodynamic forces would have unfastened them over the time of the aircraft's operation causing them to separate from the nut plates.

The maintenance personnel had adequate experience and were properly qualified for the maintenance activities under their maintenance organisation activities.

Appropriate procedures were in place for ensuring that all records were fully completed, but those procedures relied on maintenance and inspections being thoroughly completed before corresponding worksheet entries were checked off. This presented potential for a latent failure[14].

Furthermore, the operator had forms detailing appropriate compliance inspections and checks, which are meant to be completed prior to release of the aircraft to service.

For maintenance control purposes, the maintenance records when completed and signed by a licensed engineer, act as a guide for the maintenance controller to check that the necessary paperwork has been appropriately completed and signed by the nominated licensed engineer prior to the release to service.

2.6 Flight Operations

The data from the Garmin 1000 was examined and it showed that descent and approach speeds and profiles were within tolerance and in accordance with the *Kodiak 100 Pilot Operating Handbook* and *Kodiak 100 Aircraft Flight Manual*. No exceedances were observed.

The flight data shows that the flight was normal, and the crew confirmed that they observed nothing out of the ordinary during the flight.

The pilots stated during interview with the AIC that they heard a thump sound and felt it through their feet. However, while it didn't sound like it was in the cabin, they assumed that it was an unsecured life vest containing a small scuba air tank located behind the crew seats that had fallen over on the floor. They said that they thought the thump had come when the tank hit the cabin floor. The aircraft continued to fly normally.

They did not notice any disturbance to the normal flight performance when the fairing separated and even when it subsequently impacted the stabilizer. They became aware of the missing left upper wing-root fairing and the damaged tailplane during the pre-flight inspection on the flight the morning, while conducting normal walk around inspections.

[14] A **latent failure** is a result of a decision, or an action made well before an accident or serious incident, the consequences of which may lie dormant for a long time. Such failures usually originate at the decision-maker, regulator, or line management level, that is, with people far removed in time and space from the event. These failures can also be introduced at any level of the system by the human condition — for example, through time constraints and undue haste to meet deadlin

3 CONCLUSIONS

3.1 Findings[15]

3.1.1 AIRCRAFT

a) The aircraft was certified and equipped in accordance with existing *PNG Civil Aviation Rules (CARs)* and approved procedures.

b) The aircraft had a valid *Certificate of Airworthiness*.

c) The maintenance records indicated that the aircraft was maintained in accordance with existing *PNG CARs* and approved procedures.

d) The aircraft was certified as being airworthy when dispatched for the flight.

e) There was no evidence of any defect or malfunction in the aircraft that could have contributed to the serious incident.

f) There was no evidence of airframe failure or system malfunction prior to the serious incident.

g) The aircraft, while structurally intact, had sustained the in-flight loss of a left-wing upper wing-root fairing.

h) The left tailplane leading edge was significantly damaged when the left wing-root fairing impacted it in flight.

3.1.1 MAINTENANCE ENGINEERS

a) The maintenance personnel had adequate experience and were appropriately qualified for the maintenance activities under their maintenance organisation activities.

b) The post-maintenance safety inspections were not carried out adequately on the areas that were not easily visible by: the Engineer assigned to carry out the task, the Engineer who signed and released the aircraft to service, and the pilot who carried out the Operational flight check. Specifically, the upper wing surface and associated panels and fairings.

c) There was a lack of compliance with the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual,* particularly with respect to on-site supervision of maintenance.

3.1.2 PILOTS

a) The Pilot in Command (PIC) was properly licensed, medically fit, and adequately rested to operate the flight in accordance with existing *PNG CARs*.

b) The PIC's records showed that he was experienced on the Kodiak 100 with instructor qualifications.

c) The pilot under training was properly licensed, medically fit, and adequately rested in accordance with existing *PNG CARs*.

d) The records for the pilot under training showed that he was a line pilot on the Kodiak 100 undergoing route and strip familiarisation training.

e) Pilot flight experience was not relevant to this investigation.

15 Findings are not listed in an order of hierarchy or importance.

3.1.3 FLIGHT OPERATIONS

a) The flight was conducted in accordance with the procedures in the NTMA *Operations Manual.*

b). The PIC carried out normal radio communications with the relevant ATC units.

3.1.4 OPERATOR

a) Pre-flight inspection procedures, while in accordance with the NTMA procedures current at the time, were inadequate to enable inspection of the upper wing surfaces, panels and fairings.

3.1.5 FLIGHT RECORDERS

a) The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); neither were required by *PNG CARs.*

b) The aircraft was equipped with a Garmin G1000 integrated avionics system.

c) The aircraft was equipped with Go-Pro type video cameras on the left wing, tail, and in the cabin.

3.2 Causes [Contributing factors]

There was a lack of compliance with the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual,* particularly with respect to on-site supervision of maintenance.

The post-maintenance safety inspections were not carried out adequately on the areas that were not easily visible by: the Engineer assigned to carry out the task and the Engineer who signed and released the aircraft to service.. Specifically, the upper wing surface and associated panels and fairings.

The checklist item on the 300hr, 400hr, 800hr progressive inspection form was checked as satisfactory without an adequate inspection being completed for loose or missing screws.

Due to the high wing configuration of the aircraft, whether the screws were missing or not securely screwed into place, the error could easily remain undetected from the ground. Therefore, it was not picked up by the person releasing the aircraft to service or other maintenance personnel or subsequent flight crew performing pre-flight inspections.

The *Daher Kodiak 100 Pre-flight Checklist* did not include a check of the exterior of the airframe to ensure security of inspection doors, panels, and caps, nor does not require flight crew to perform a cursory visual check of visible rivets and fasteners on the exterior of the airframe.

It is likely that if the screws were in place but not adequately secured, the in-service aircraft vibrations and aerodynamic forces could have unfastened them over the time of the aircraft's post-maintenance operation causing them to separate from the nut plates.

4 SAFETY RECOMMENDATION

4.1 Recommendation number *AIC 23-R13/22-2001* to New Tribes Mission Aviation (PNG) Limited

The PNG Accident Investigation Commission (AIC) recommends that that New Tribes Mission Aviation (PNG) Limited (NTMA) should ensure that their relevant documents, manuals and operational procedures are amended to include pre-flight inspection requirements for pilots to conduct visual inspections of the exterior of the airframe to ensure security of inspection doors, panels and caps, and airframe rivets and fasteners.

Action requested

The AIC requests that New Tribes Mission Aviation (PNG) Limited note recommendation *AIC 23-R13/22-2001* and provide a response to the AIC within 90 days of the issue date and explain (including with evidence) how New Tribes Mission Aviation (PNG) Limited has addressed the safety deficiency identified in the safety recommendation.

4.2 Recommendation number *AIC 23-R14/22-2001* to New Tribes Mission Aviation (PNG) Limited

The PNG Accident Investigation Commission (AIC) recommends that New Tribes Mission Aviation (PNG) Limited (NTMA) should review its in-service maintenance standard operating procedures (SOPs) to ensure that supervisors are fully conversant with the explicit procedures and instructions in the NTMA *Maintenance Organisation Manual*, particularly with respect to on-site supervision, to ensure approved engineering techniques, practices and approved data are being applied correctly before certifying for release to service.

- The outcome of the review should ensure that authorised persons are appropriately qualified and experienced to supervise inspections and maintenance in compliance with the approved SOPs. Furthermore, LAMEs and AMEs should have no doubts as to the requirements for supervised work practices.

Action requested

The AIC requests that New Tribes Mission (PNG) Limited note recommendation *AIC 23-R14/22-2001* and provide a response to the AIC within 90 days of the issue date and explain (including with evidence) how New Tribes Mission Aviation (PNG) has addressed the safety deficiency identified in the safety recommendation.

5 APPENDICES

5.1 Appendix A: Quest (Daher) Kodiak 100 IPC Excerpt Fairing Locations and Description

5350 Fairings

5350.1 Description

A. The external aerodynamic fairings include the wing, horizontal and vertical tip caps, the tailcone, wing root fairings, landing gear fairings, and control rod covers. The repair procedures are covered in this section regardless of JASC code due to the similarity of construction and materials

B. All composite external aerodynamic fairings are non-structural items and are fabricated from woven fiberglass cloth type "E" style 7781 conforming to MIL-C-9084, Type VIII A with proper finishes for resin systems used. Refer to the materials table in this section for compatible resins. Standard wet layup repair techniques as described in Chapter 51 Standard Practices and AC 43.13-1B Ch 3 are approved for use. If repair of the damaged part is extensive, the part should be replaced. Vacuum bagging is recommended, but is not required. Regardless of the layup and cure method used, voids and entrapped air must be avoided

C. Landing gear leg fairings are also non-structural, fabricated from sheet aluminum and may be repaired per Chapter 51, Standard Practices and AC 43.13-1B, Chapter 4

Figure 53-14: Fairing Location Diagram

5350.2 Inspection and Damage Classification

A. Refer to Chapter 51 for inspection methods and damage classification.

5350.3 Limitations

A. Standard wet layup repair procedures as described in Chapter 51 Standard Practices and AC 43.13-1B Ch 3 are approved for use. If repair of the damaged part is extensive, the part should be replaced. Vacuum bagging is recommended, but is not required. Regardless of the layup and cure method used, voids and entrapped air must be avoided.

5350.4 Specific Repairs

5350.4.1 EXTERNAL AERODYNAMIC FAIRING REPAIRS

5350.4.1.1 DESCRIPTION/SUBJECT

Not Used

5350.4.1.2 PARTS, TOOLS AND EQUIPMENT

Item Description	Part No.	Manufacturer
Type 'E' Style 7781 Woven Glass Fabric	Conforming to MIL-C-9084, Type VIII A	Commercially Available
Epoxy Resin	6167 A/B	Magnolia Plastics
Polyester Resin	Hydrex 33253-01	Reichhold, Inc.
Polyester Resin	Hydrex 33350	Reichhold, Inc.
Polyester Surfacing Primer	707-002 (Gray)	Dura Technologies

Table 53-4: Fairing Repair Materials

5350.4.1.3 LIMITATIONS

1. Repair procedures as described in Chapter 51 Standard Practices and AC 43.13-1B Chapter 3 are approved as long as aerodynamic shape is preserved and there is negligible weight increase to the part. Additional repairs are described in Subsection 5350.4.1.4 for specific failure modes.

5350.4.1.4 INSTRUCTIONS

1. Preparation:
   a. Refer to Section 5100 for standard practices of removing damage, preparation and cleaning.
   b. Polyester Resin Catalysis
      (1) Gel times or pot life is the time it takes the resin to set up in the container after proper and thorough mixing with accelerators and catalysts. Gel times can be adjusted significantly by varying the amounts of these materials. Gel times also will vary significantly with the batch size if left in a container or with a very thick laminate.
      (2) The following sections provide details on specific resin and catalyst mixtures.

WARNING: Exercise care with MEKP catalyst. Contact with eyes must be prevented. In the event of contact, flush eyes immediately and contact a physician immediately. Never mix MEKP without eye protection. Read recommendations on catalyst supply bottle.

5.2 Appendix B: Quest (Daher) Kodiak 100 IPC Torque Data

1430 Torque Data

1430.1 Description and Operation

1430.1.1 GENERAL DESCRIPTION

A. The torque procedures and values listed in this chapter and any other applicable sections in this manual should be adhered to in order to ensure the security and prevent the overstressing of components during installation.

B. Standard torque values are listed in the following tables and should be used unless otherwise specified in the maintenance procedures sections. Some specialty components will require torque values that differ from the standard torques listed.

C. Torque is applied and measured by the use of a torque wrench or by the nut-rotation method. Various adapters may be utilized in conjunction with a torque wrench when applications call for them. The following tables are provided as an aid in computing the proper torque value.

1. **Figure 14-1 — Recommended Torque Values for Fine Thread Series Fasteners**
2. **Figure 14-2 — Recommended Torque Values for Coarse Thread Series Fasteners**

D. The friction-drag torque value must be accounted for to get the correct torque results. Friction-drag torque is the torque required to turn a nut on its respective bolt when the nut is nearly in contact with the washer or bearing surface. Friction-drag torque is only the torque required to turn the nut on the bolt. Friction-drag torque does not include any torque that is applied to tighten the nut and bolt. To get the total torque value, add friction-drag torque to the specified torque. Total torque = friction-drag torque + specified torque.

E. General Notes on Torque Procedures:

1. The following torque requirements are not applicable to threaded parts used for adjustment. Examples of these are turnbuckles and rod ends.
2. The indicated torque values are for clean and dry parts. Threaded fasteners must be free of metal filings, burrs, cross-threading, stripped threads, bends, rounded flats, manufacturing defects, or any other damage that causes the fastener to be in any condition other than as designed. Lubricants, other than provided on the nut as it comes from the factory, should not be used unless otherwise specified in the maintenance procedures.
3. Assembly of standard threaded fasteners such as bolts, nuts, and screws should be torqued as specified in **Figure 14-1** and **Figure 14-2**.
4. Torque should be applied to the nut on a bolt/nut application. If the nut is inaccessible, increase the maximum torque value by adding the bolt shank friction. Measure the bolt shank friction with a torque wrench.
5. Thread Engagement:

   A threaded fastener that is properly installed must have a minimum of one full thread showing beyond the edge of the nut; additionally, the fastener must be capable of being torqued to the specified value without "bottoming-out" the threads. In the event that a bolt has excessive thread engagement, it is permissible to install additional washers as required, provided they are the same type (i.e. same part number) specified for that fastener on the drawing. Additional washers added to address excessive thread engagement must be placed under the nut; not under the head. In the event that no washer is specified, a washer may be chosen that is of the same material and finish as the nut or bolt that it contacts.

NOTE: It is NOT permissible to adjust the bolt length to address instances of excessive thread engagement.

6 Sheet metal screws should be tightened until snug, but never to the point of stripping either the screw or the materials being fastened; however, no specified torque applies.

7. Straight, threaded connections, which include o-rings or gaskets for sealing purposes need not be tightened to any specific torque value, but should be installed per AN10064 instructions. Examples of sealed connectors are AN924, AN6298 and MS33656 Style E

8. Countersunk washers used in conjunction with close tolerance bolts must be installed correctly with the recessed face of the washer facing the bolt head.

9 When Hi-Lok Fasteners are used with MS21042, self-locking nuts, both the fastener and the nut should be lubricated prior to tightening

10 Screws attached to nutplates, or screws with threads but not listed in the following figures should be tightened firmly, but not to a specified torque value. When installing a screw in conjunction with a dimpled washer (such as NAS1169), ensure the dimple is installed in the proper direction; that is, mate the washer to the screw shape, such as a tapered head underside that is used for countersinking, or a raised crown (sometimes called a "finishing washer") that is used to protect a raised screw head edge. Do not deform the washer by over tightening the screw, and do not damage, strip, or round the screw head.

11. Control System Installation: In general, standard torque values found in **Figure 14-1** and **Figure 14-2** are to be used for bolts, nuts, and screws in the control system installation. However, when the nut is tightened against a clevis fork that requires free rotation, the nut should be torqued to 5 in-lb, then backed off one castellation and secured with a cotter pin. Ensure the joint rotates freely.

NOTE: The nut securing the control column to the aileron chain guard should be torqued to 5 in-lb, then backed off one castellation and secured with a cotter pin. Refer to **Figure 27-15** for further details.

12. Castellated Nuts:

a. Self-locking and non-self-locking castellated nuts require cotter pins.

b. For castellated nuts where alignment with a cotter pin hole is required, begin by applying the minimum torque (accounting for friction drag as necessary)(see **Figure 14-1** or **Figure 14-2**). Continue to move the nut into alignment taking care to not exceed the maximum torque. In the event that alignment is not achievable, a different nut or bolt of the same part number must be used until alignment is achieved within the acceptable torque range. If the desired fit still cannot be achieved, it is permissible to install additional washers to obtain a proper fit as described in **Item 5** "Thread Engagement" above.

c. The end of the bolt or screw should extend through the nut at least two full thread lengths, of which one thread length is the chamfer.

13. Joints containing flexible or crushable materials such as wood, plastics, rubber, or other similar material should be torqued to a value approximately 80% of the torque at which crushing of the material is observed or to the torque listed in **Figure 14-1** or **Figure 14-2**, whichever is the lowest value.

14 In certain cases, this manual may call for torque to be applied in a manner that does not specify a torque value. For example, when tightening a propeller grease fitting, the instructions may direct the fitting to be tightened until "snug". In such cases, the manual calls upon the experienced technician's judgment to determine by feel if resistance is enough to keep a fastener or fitting, as well as the affected object as applicable, in place under operation, but is not so great as to risk stripping or damaging the fitting or object. For example, when tightening a fitting, the technician will compare by feel the resistance as it is threaded (friction-drag or bolt shank torque) with the point at which resistance increases sharply, then give one more 1/8 to 1/4 turn if needed. Extreme caution should be used with soft metals such as aluminum and soft materials such as plastics.

5.3 Appendix C: Genuine Aircraft Hardware Co-Screw Specifications

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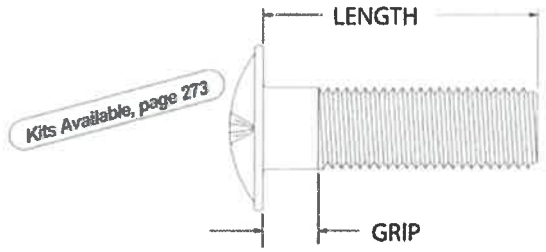
Genuine Aircraft Hardware Co.

AN525 Series

Washer Head, Structural Screws, Phillips Drive, Alloy Steel

TENSILE STRENGTH, 125,000 PSI (Minimum), one (X) on head
PLATED CADMIUM II OR ZINC II, (BOTH GOLD IN APPEARANCE)



Example of Part Number:
AN525-832R9 = 8-32 threads, 9/16 Overall Length under the head, 5/32" grip

The tolerance for Overall Length is ± 1/32" The tolerance for Grip Length is ± 1/64"

	AN525-(DIA./THREADS) R (LENGTH)					
D= Threads, Dia - Pitch Overall (Length)	8-32 Grip Length	8-32 Size Number	10-32 Grip Length	10-32 Size Number	1/4-28 Grip Length	1/4-28 Size Number
3/8	1/32	832R6	1/32	10R6	1/32	416R6
7/16	1/16	832R7	1/16	10R7	1/16	416R7
1/2	1/8	832R8	1/8	10R8	1/8	416R8
9/16	5/32	832R9	5/32	10R9	5/32	416R9
5/8	7/32	832R10	7/32	10R10	7/32	416R10
11/16	9/32	832R11	9/32	10R11	9/32	416R11
3/4	11/32	832R12	11/32	10R12	11/32	416R12
13/16	13/32	832R13	13/32	10R13	13/32	416R13
7/8	15/32	832R14	15/32	10R14	15/32	416R14
15/16	17/32	832R15	17/32	10R15	17/32	416R15
1"	19/32	832R16	19/32	10R16	19/32	416R16
1 1/8	23/32	832R18	23/32	10R18	23/32	416R18
1 1/4	27/32	832R20	27/32	10R20	27/32	416R20
1 3/8	31/32	832R22	31/32	10R22	31/32	416R22
1 1/2	1 3/32	832R24	1 3/32	10R24	1 3/32	416R24
1 5/8	1 7/32	832R26	1 7/32	10R26	1 7/32	416R26
1 3/4	1 11/32	832R28	1 11/32	10R28	1 11/32	416R28
1 7/8	1 15/32	832R30	1 15/32	10R30	1 15/32	416R30
2"	1 19/32	832R32	1 19/32	10R32	1 19/32	416R32

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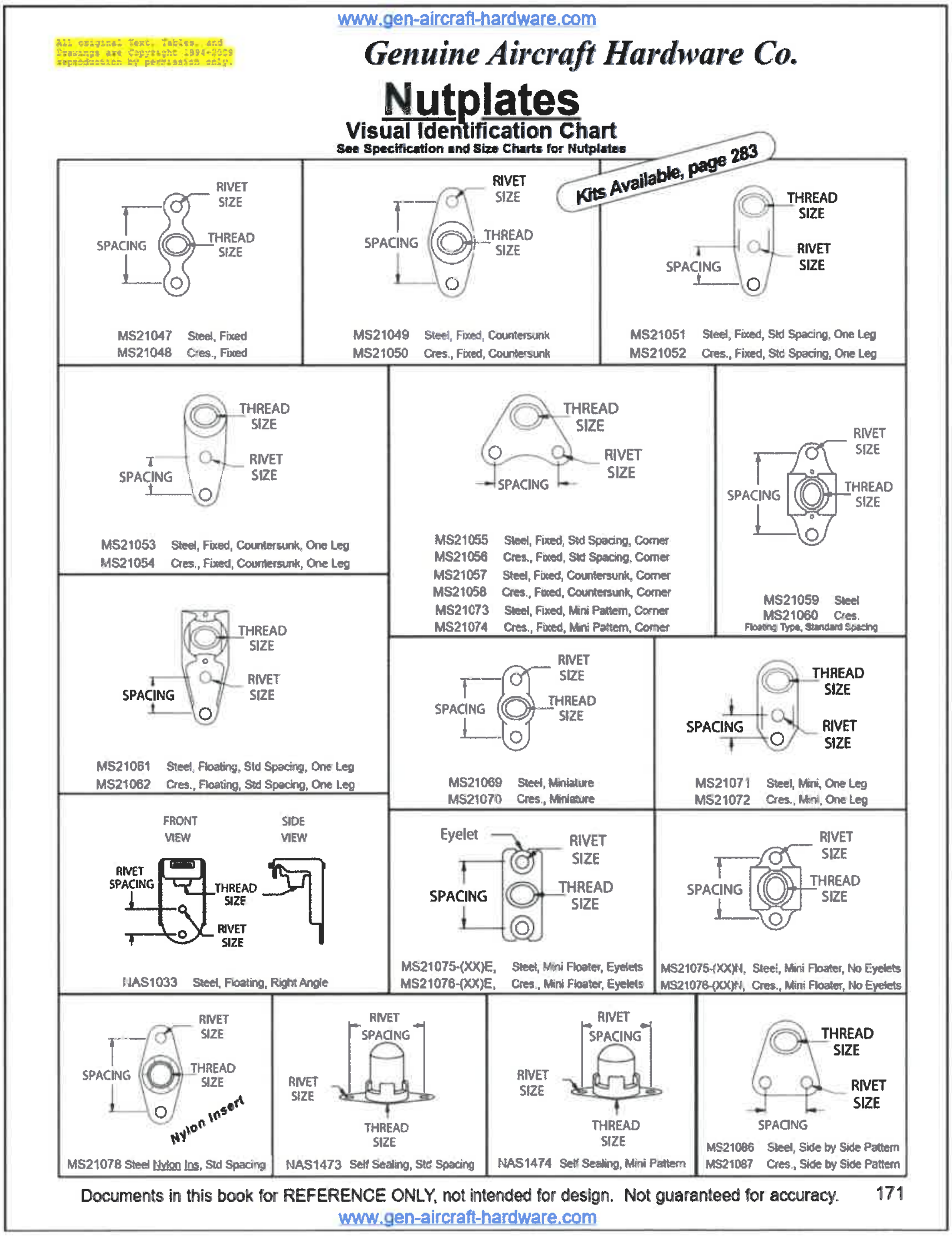
5.4 Appendix D: Genuine Aircraft hardware Co Nutplates Visual Identification Chart



5.5 Appendix E: Genuine Aircraft hardware Co Nutplates Selection Chart

Genuine Aircraft Hardware Co.

Shaded areas are for reference only; ORDER PART NUMBERS IN UNSHADED AREAS ONLY !

PART#	Supersedures / Notes	Spacing Chart	Pattern	Material	Plating	Max Temp	Rated Tensile
MS21047 (XX)	AN352F, AN366F NAS680A, NAS1023A	A	Standard , Fixed	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21048 (XX)	AN362CW, AN366CW, NAS680C, NAS1023C	A	Standard , Fixed	Cres.	Silver	800 Deg	125 Ksi.
MS21049 (XX)	AN361, AN373F, NAS681A / Sizes 8-32 thru 5/16-24	A	Std, Fixed, C/S	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21050 (XX)	AN361C, NAS681C / Sizes 8-32 thru 5/16-24	A	Std, Fixed, C/S	Cres.	Silver	800 Deg	125 Ksi.
MS21051 (XX)	NAS682A, NAS1025A	C	Std, Fixed, 1 Leg	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21052 (XX)	NAS682C, NAS1025C	C	Std, Fixed, 1 Leg	Cres.	Silver	800 Deg	125 Ksi.
MS21053 (XX)	NAS683A / Sizes 8-32 Thru 5/16-24	C	Fixed, C/S, 1 Leg	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21054 (XX)	NAS683C / Sizes 8-32 Thru 5/16-24	C	Fixed, C/S, 1 Leg	Cres.	Silver	800 Deg	125 Ksi.
MS21055 (XX)	NAS684A, NAS1027A	D	Std, Fixed, Corner	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21056 (XX)	NAS684C NAS1027C	D	Std, Fixed, Corner	Cres.	Silver	800 Deg	125 Ksi.
MS21057 (XX)	NAS685A / Sizes 8-32 Thru 5/16-24	D	Fixed, Corner, C/S	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21058 (XX)	NAS685C / Sizes 8-32 Thru 5/16-24	D	Fixed, Corner, C/S	Cres.	Silver	800 Deg	125 Ksi.
MS21059 (XX)	NAS686A NAS1031A	A	Standard, Floater	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21060 (XX)	NAS686C, NAS1031C	A	Standard, Floater	Cres.	Silver	800 Deg	125 Ksi.
MS21061 (XX)	NAS687A, NAS1032A	C	Std, Floater, 1 Leg	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21062 (XX)	NAS687C, NAS1032C	C	Std, Floater, 1 Leg	Cres.	Silver	800 Deg	125 Ksi.
MS21069 (XX)	NAS697A	B	Fixed, Mini	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21070 (XX)	NAS697C	B	Fixed, Mini	Cres.	Silver	800 Deg	125 Ksi.
MS21071 (XX)	NAS696A	E	Fixed, Mini, 1 Leg	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21072 (XX)	NAS696C	E	Fixed, Mini, 1 Leg	Cres.	Silver	800 Deg	125 Ksi.
MS21073 (XX)	NAS698A	F	Fixed, Mini, Corner	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21074 (XX)	NAS698C	F	Fixed, Mini, Corner	Cres.	Silver	800 Deg	125 Ksi.
MS21075 (XX)	NAS1068A	B	Mini, Floater	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21076 (XX)	NAS1068C	B	Mini, Floater	Cres.	Silver	800 Deg	125 Ksi.
MS21078-(XX)	Nylon Locking Element , NAS1023N	A	Standard , Fixed	Steel / Nylon	Cadmium II	250 Deg	125 Ksi.
MS21086 (XX)	NAS1067A / Sizes 8-32 Thru 3/8-24	G	Side by Side	Steel	CAD II / Black Moly	450 Deg	125 Ksi.
MS21087 (XX)	NAS1067C / Sizes 8-32 Thru 3/8-24	G	Side by Side	Cres.	Silver	800 Deg	125 Ksi.
NAS1033A (XX)	Available in 6-32, 8-32, 10-32	N/A	Right Angle, Floater	Steel & Cres.	Nut-Cad, Cage None	450 Deg	125 Ksi.
NAS1473A (XX)	Available in 8-32 thru 5/16-24	A	Std, Self Sealing	Steel	Cadmium II	225 Deg	125 Ksi.
NAS1474A (XX)	Available in 4-40 thru 1/4-28	H	Mini, Self Sealing	Steel	Cadmium II	225 Deg	125 Ksi.

Nutplate Selection Chart

5.6 Appendix F: Genuine Aircraft hardware Co-Nutplates spacing charts/Size Charts/Part Number

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Genuine Aircraft Hardware Co.

Nutplates

Spacing Charts / Size Charts / Part Number Examples

Please refer to VISUAL IDENTIFICATION chart and SELECTION chart on previous pages to assist in determining the proper PART #.

Rivet Spacing Chart "A"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 10-32	.688
1/4-28 Thru 3/8-24	1.00

Rivet Spacing Chart "B"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40	.406
6-32	.437
8-32	.469
10-32	.500
1/4-28	.562
5/16-24	.718
3/8-24	.828

Rivet Spacing Chart "C"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 3/8-24	.312

Rivet Spacing Chart "D"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 10-32	.486
1/4-28 Thru 3/8-24	.707

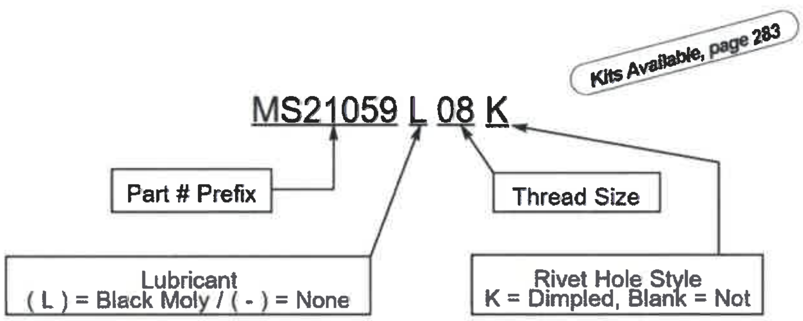
Rivet Spacing Chart "E"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 10-32	.219
1/4-28 Thru 3/8-24	.269

Rivet Spacing Chart "F"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40	.287
6-32	.308
8-32	.331
10-32	.354
1/4-28	.398
5/16-24	.508
3/8-24	.585

Rivet Spacing Chart "G"	
Nut Threads Dia. - Pitch	Rivet Spacing
8-32 Thru 1/4-28	.219
5/16-24 Thru 3/8-24	1.00

Rivet Spacing Chart "H"	
Nut Threads Dia. - Pitch	Rivet Spacing
4-40 Thru 10-32	.590
1/4-28	.752

Thread Sizes (XX)	
Dash #	Dia. - Pitch
04	4-40
06	6-32
08	8-32
3	10-32
4	1/4-28
5	5/16-24
6	3/8-24



Dimpled rivet holes are NOT available for the following part numbers: MS21075, MS21076, NAS1033, NAS1473, NAS1474.
Rivet size is 3/32 for nutplates sizes 4-40 thru 1/4-28. Rivet size is 1/8" for nutplates sizes 5/16-24 and 3/8-24.
If Black Moly is used with Corrosion Resistant nutplates the maximum temperature is 450 degrees F.

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5.7 Appendix G: Normal Procedures-Preflight Inspection

4-20 AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

The preflight inspection checklist is recommended for utilization prior to each flight. If the airplane has been in storage for an extended amount of time, has had recent major maintenance work, or has been operated from rough or unimproved surfaces; a more extensive exterior inspection is recommended.

Flights taking place at night or in cold weather involve careful preflight inspection of other specific areas which are outlined in this section.

Following the accomplishment of major maintenance procedures on the airplane, the preflight inspections should be modified to pay extra attention to the flight controls and trim tabs to ensure freedom of movement and actuation in the correct direction. Also, check all inspection panels on the airplane to ensure proper security of installation.

If the airplane has been exposed to ground handling, especially in a crowded hanger, it should be checked carefully for dents and scratches on the wings, fuselage, propeller, flight controls and empennage. Also check for damage to navigation lights, strobe lights and antennas. If the airplane has been parked outside in high wind conditions or exposed to propeller/jet wash, carefully inspect the flight control surface stops, hinges and brackets for signs of wind damage.

If the airplane has been operated into an unimproved runway/taxiway, check the propeller blade tips and the leading edges of the propeller blades and horizontal tail for abrasions. Airplanes operated in and out of unimproved strips, especially at high altitudes, are subjected to high loads on the landing gear. Accomplish frequent inspections of the landing gear, tires and brakes.

Outside storage may result in water accumulation in the pitot/static system and fuel tanks. Dust and dirt can also enter the engine air inlet and exhaust areas. If any water is expected in the static line, open the static source drain valve and drain completely. Ensure the static source drain valve is returned to the closed position prior to flight.

If any water is found to be present in the fuel system, the inboard fuel tank sump quick drain valves, fuel reservoir quick drain valve and the firewall fuel filter quick drain valve should all be thoroughly drained and checked until there is no further sign of water or debris contamination of the fuel system.

Prolonged storage of the aircraft may result in considerable water buildup in the fuel system due to water separating from fuel additives. This is indicated by excessive amounts of water accumulating in the fuel tank sumps. Refer to **Section 8** of this handbook for fuel system servicing procedures.

To prevent inadvertent loss of fuel in flight, ensure the fuel tank filler caps are tightly sealed following visual checks of the fuel quantity or servicing. The fuel system vents should be inspected for obstructions, ice or water, especially following flights into cold weather.

The interior inspection will vary according to the type of flight plan and the optional equipment installations. Prior to flights at high altitudes, it is important to check the oxygen supply equipment for proper operation and availability of face masks and hose assemblies.