Australian Government

Australian Transport Safety Bureau

Safe Transport

Aviation Safety Investigation Report 200304074

Robinson Helicopter Co

R22

28 September 2003

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Occurrence Number:	**200304074**	Occurrence Type:	**Accident**
Location:	**93km S Derby**		
State:	**WA**	Inv Category:	**3**
Date:	**Sunday 28 September 2003**		
Time:	**1000** hours	Time Zone:	**WST**
Highest Injury Level:	**Fatal**		

Injuries:

	Fatal	Serious	Minor	None	Total
Crew	1				1
Passenger	1				1
Ground					
Total	2				2

Aircraft Manufacturer:	**Robinson Helicopter Co**		
Aircraft Model:	**R22**		
Aircraft Registration:	**VH-UXF**	Serial Number:	**0065**
Type of Operation:	**Commercial Aerial Mustering**		
Damage to Aircraft:	**Substantial**		
Departure Point:	**Yakka Munga Station**		
Departure Time:			
Destination:	**Yakka Munga Station**		

Crew Details

Role	Class of Licence	Hours on type	Hours Total
Pilot-In-Command	**Commercial**	**1419.8**	**1420**

Approved for Release: **01-OCT-04**

FACTUAL INFORMATION

History of the flight

On 28 September 2003, a Robinson Helicopter Company model 22 helicopter (R22) registered VH-UXF was engaged in aerial mustering operations with another R22 helicopter registered VH-AOP. The helicopters were operating in an area 93 km south of Derby, Western Australia. The pilot of UXF returned from a refuelling stop and had been in the mustering area for about 30 minutes when the pilot of AOP noted that he had not heard any radio transmissions from the pilot for about 10 minutes. He commenced a search and soon after, located UXF at the edge of a claypan.

The pilot landed close to UXF in order to assist the two occupants. After isolating the helicopter’s electrical system, he attempted to comfort and provide first aid to them. However, because of the apparent nature and extent of their injuries, he decided to seek medical assistance from Derby.

About 80 minutes later, the pilot returned to the scene of the accident with a doctor from Derby. The doctor determined that, in the intervening period, both occupants of UXF had succumbed to their injuries.

Wreckage findings

The helicopter had impacted the ground heavily, with little forward speed. It remained upright, with the impact being primarily on the right skid, which collapsed due to failure of the structure.

Both main rotor blades exhibited evidence of low speed rotation at the time of impact, and minor damage consistent with having struck the surrounding small trees. There was no evidence to indicate that the main rotor blades had contacted the cabin structure, or evidence of excessive in-flight main rotor coning angle.

During the impact sequence, the tail rotor struck the ground at high rotational speed and was destroyed, with sections of the tail rotor found approximately 40 m from the crash site. The clutch assembly exhibited signs of high-speed rub damage due to contact with the clutch linear actuator mechanism.

The failure of the right skid allowed the engine induction system and carburettor to impact the ground beneath the helicopter. The engine support structure deformed upward and to the left, consistent with the impact attitude of the helicopter. Fuel lines to the carburettor had been damaged, and the contents of both fuel tanks leaked into the sand beneath the helicopter.

On-site examination of the A166 clutch shaft revealed that the shaft had failed at the point of connection to the main rotor gearbox input yoke. The helicopter was subsequently recovered to a local engineering facility in order to conduct a more detailed examination by the ATSB.

That examination indicated what appeared to be a pre-impact failure of the clutch shaft, which was taken to the ATSB laboratory in Canberra for further technical examination. The examination also indicated that the engine was operating at high power when the helicopter impacted the ground. There was no pre-impact damage or faults found in other helicopter systems that would have contributed to the accident.

The installed emergency locator transmitter (ELT) had been dislodged from its mounting frame during the impact. The external ELT antenna was missing from its mounting, and could not be located in the area surrounding the wreckage. There was no damage evident to the antenna connector on the airframe. The ELT was recovered for technical examination.

Fuel

The pilot of AOP reported that the pilot of UXF would have '…put on about 1.5 to 2 hrs of fuel' at his last refuelling stop due to the requirement to continue the muster while carrying a passenger. That meant that at the time of the accident the helicopter had a minimum endurance of about 1 hour.

The investigation recovered a small amount of fuel from the fuel supply strainer bowl. That fuel was clean, free from visible contaminants and had a green colouring consistent with it being aviation gasoline.

A fuel sample was collected from the fuel drums from which the helicopter was last refuelled. Laboratory examination of that sample confirmed that it met the specifications for aviation gasoline.

Technical examination of the failed clutch shaft

The clutch shaft was installed in the helicopter on 30 October 2002, and had 886.2 hours time-in-service since new. Maintenance records showed that it had been installed in accordance with the Robinson Helicopter Company R22 maintenance and overhaul manual.

The clutch shaft had fractured at the point of connection to the main rotor gearbox flex-plate yoke (see figure 2 of Appendix A – Technical Analysis Report). The fracture surface indicated pre-existing torsional fatigue cracking, which followed a spiral path from within the yoke connection, and extended around the shaft for approximately 340 degrees over an axial length of about 25 mm. Those crack propagation features were consistent with the initiation and progressive growth of the crack during multiple shaft load cycles prior to the accident flight.

Examination found that when the clutch shaft was assembled to the flex-plate yoke, paint was left on the surface beneath the bearing blocks. That resulted in the applied bolt tension reducing over time. The examination also found that an unapproved jointing compound had been used when the shaft and yoke were last assembled.

For detailed information on the examination of the failed clutch shaft, refer to appendix A – ATSB Technical Analysis Report No. 25/03.

The pilot

The pilot held a Commercial Pilot (Helicopter) Licence and was appropriately endorsed on the R22. He held a valid medical certificate. The pilot had accumulated 1,419.8 hours of helicopter flight time, all of it in the R22. He had completed a course of instruction in the operation of helicopters at low level, and held an aerial stock mustering approval. The pilot last attended a Robinson Helicopter R22 Safety Course in April 2002.

It was reported that the pilot had been adequately rested prior to commencing duty on the day of the accident.

Airworthiness

The helicopter was constructed in 1980 as a standard R22 model. In 1987, the helicopter was returned to the manufacturer for an overhaul, during which it was upgraded from an R22 to an R22 HP model. That upgrade included the installation of a higher compression engine than was initially installed in the R22. Examination of the helicopter's maintenance records revealed that an auxiliary fuel tank was fitted to the helicopter in 1996. No information was found to indicate that either a supplemental type certificate (STC), or a Civil Aviation Regulation 35 engineering order (EO) was produced to meet regulatory requirements for installation of the tank to UXF. The current operator reported that the helicopter was in that configuration when purchased in 2002.

A helicopter type certificate data sheet (TCDS) lists the conditions and limitations for each of the models of helicopter for which the certificate was issued. These conditions and limitations ensure that the helicopter meets the airworthiness requirements of Title 14 of the US Code of Federal Regulations (commonly known as the Federal Aviation Regulations).

The TCDS H10WE was issued to the Robinson Helicopter Company by the US Federal Aviation Administration, and covered the R22 range of helicopters. Item I of the TCDS listed the conditions and limitations applicable to the R22 model helicopter. Information from the manufacturer indicated that the R22 HP model helicopter was also covered by item I of TCDS H10WE.

The specifications listed at item I included the maximum gross weight (MGW) of the helicopter and the fuel capacity. The MGW listed was 1,300 lbs (590 kg), and the fuel capacity was listed as 19.8 US gals (75 litres). The TCDS did not include the installation of an auxiliary fuel tank to either the R22 or R22 HP model helicopters.

Weight and balance

The helicopter was last weighed in 1990. At that time, its recorded basic weight was 378.3 kg. The recorded equipment list did not include the installation of an auxiliary fuel tank. The weight of an auxiliary fuel tank installation was 3 kg, resulting in an actual helicopter basic weight of 381.3 kg. No adjustment was made to the helicopter’s weight and balance record to take account of the installation of the auxiliary fuel tank.

Baggage and equipment was recovered by police and ATSB personnel from each under-seat baggage compartment. The personal items were quarantined by the Police and were subsequently weighed. The total estimated weight of the items removed from under the seats was about 30 kg. The distribution of the items was approximately equal beneath each seat.

The TCDS and the Rotorcraft Flight Manual (RFM) limited each seat and under-seat baggage and equipment load to less than 240 lbs (109 kg). In the occurrence helicopter, the estimated right (pilot) seat and baggage loading was 117 kg, and the left seat loading was 85 kg. The right combined seat and under seat baggage limit was therefore exceeded by 8 kg.

The helicopter was estimated to weigh 633 kg at the time of the accident. That weight was 43 kg above the 590 kg MGW limit for the R22 and R22 HP model helicopters.

The position of the loaded centre of gravity (c.g) at the estimated helicopter weight of 633 kg was calculated to be 2,436.05 mm aft of the datum. When plotted on the applicable c.g range envelope, the c.g and was found to be outside the allowable limits prescribed by the TCDS and the RFM.

Survivability

The ELT was activated by the impact, and was transmitting when the investigation team arrived on site. However, the radiated signal would have had a minimal range due to the lack of its external antenna. Laboratory examination confirmed that the ELT was capable of normal operation.

The structural integrity of the helicopter seats satisfied the applicable certification requirement. The seats’ structures were designed to deform, allowing absorption of vertical impact forces. Information from the manufacturer indicated that deformation of the seats’ structure afforded protection to the occupants above that mandated during certification of the helicopter.

The combined effect of the vertical impact of the helicopter, and the weight of the occupants resulted in some crushing deformation of the seats’ structure. The under-seat baggage and equipment were also crushed during that deformation, with several items exhibiting severe deformation. The seats’ structures could not deform to their fullest extent due to the stowed baggage and equipment.

The carriage of baggage and equipment in the under-seat baggage compartments is not prohibited by the manufacturer. However, a warning placard in each compartment cautions pilots to ‘avoid placing objects in compartment which could injure occupant if seat collapses during hard landing’.

The post mortem examination of the pilot and passenger revealed injuries consistent with a heavy, vertical impact.

ANALYSIS

The pilot was conducting mustering operations, which by their nature, often place the helicopter in a flight regime close to the ground with low forward air speed. That can leave the pilot with little time, or potential, to respond effectively to failure of a critical flight system such as the main rotor drive mechanism.

The clutch shaft failure resulted in an unusual emergency situation for the pilot. Symptoms would have included a failure of the drive to the main rotor gearbox, decreasing main rotor speed, and nose left yaw. That was consistent with some of the symptoms normally associated with an engine failure. However in this case the engine had not failed and initially would have presented the pilot with additional and potentially confusing symptoms. Those confusing symptoms would have included an initial indication of engine overspeed, and continuing tail rotor drive.

The normal response to an engine failure, and also relevant in this case, was for the pilot to lower the collective control in order to recover any loss of main rotor RPM. The pilot would then allow the helicopter to enter an autorotation descent. If there was insufficient height for the descent to stabilise, main rotor RPM would not have recovered before the pilot commenced the touchdown phase of the autorotation. Low main rotor RPM during the touchdown phase would have minimised any possibility for the pilot to reduce the helicopter’s rate of descent to carry out a safe touchdown.

Despite the unusual nature of this emergency and difficulty establishing autorotation due to the probable flight regime, the pilot managed to maintain the helicopter upright and with little forward speed at touchdown. However, due to the likely low main rotor RPM, the pilot was unable to arrest the rate of descent, and the helicopter impacted the ground with considerable force.

Installation of the auxiliary fuel tank by a previous owner meant that technically the helicopter was not in an airworthy state at the time of the accident, as it did not meet the certification requirements of the type certificate data sheet. In addition, that installation could have led the occurrence pilot to assume that the helicopter was a later R22 Alpha or Beta model, each of which had a higher maximum take-off weight.

The investigation was unable to determine the extent and duration of any possible inadvertent overweight operation of the helicopter. However, operation of the helicopter in an overweight condition may have contributed in some measure to the failure of the clutch shaft.

The carriage of baggage and other equipment in the under-seat baggage compartments limited the intended deformation of the seats' structure in response to a heavy vertical impact. The investigation was unable to establish the extent to which that compromised the survivability of the occupants during the impact sequence.

While the ELT operated normally, the lack of the external antenna meant that the emergency signal could not be received by other pilots and notified to Australian Search and Rescue. There was no damage on the antenna connector to indicate that the antenna had been dislodged during the impact. Had UXF not been operating in company with AOP and the pilot of that helicopter not been alert to the situation, the lack of a radiating ELT signal may have hampered any search. The investigation was unable to determine if the antenna was fitted to the helicopter for the accident flight.

Inappropriate assembly procedures led to the formation of the fatigue crack in the clutch shaft. The design of the shaft and the location of the crack were such that daily inspections by either pilots or maintenance engineers were unlikely to detect the crack until shaft failure was imminent.

FINDINGS

1. The pilot was correctly licensed, endorsed on type, and had a current medical certificate at the time of the accident.
2. The pilot was reported to have been adequately rested prior to the accident.
3. The A166 clutch shaft failed due to a fatigue crack that initiated from one of the shaft bolt holes.
4. A non-approved jointing compound was used during the last assembly of the A166 shaft to A907 yoke.
5. The A166 shaft to A907 yoke bearing blocks were installed over a painted surface during the last assembly.
6. The helicopter was technically unairworthy at the time of the accident.
7. The helicopter was being operated in an overweight condition at the time of the accident.
8. The helicopter impacted the ground heavily in a vertical direction with little forward speed.
9. The stowage of baggage and equipment beneath the seats prevented the seats from deforming to their fullest extent.
10. The fixed ELT activated during the impact, but the external antenna was not attached to the helicopter at the time of the impact.

SIGNIFICANT FACTORS

1. The failure of the A166 clutch shaft was due to the inappropriate assembly of the shaft to the A907 yoke.

2. The loss of main rotor drive most likely occurred at a combination of height and speed that was insufficient to enable the pilot to conduct a successful autorotation.

SAFETY ACTION

ATSB Safety Action

On 6 November 2003 the Australian Transport Safety Bureau (ATSB) issued recommendation R20030211 to the Civil Aviation Safety Authority (CASA). As a result of that recommendation, CASA issued airworthiness directive AD/R22/51, which mandated inspections of the A166 shaft to A907 yoke on all R22 helicopters operating in Australia.

CASA issued AD/R44/019 on 28 November 2003, mandating the same inspection on those R44 helicopters that had had the C166 shaft to C907 yoke disassembled since installation at the factory.

Following the issue of the airworthiness directives, information from CASA and the industry indicated that the use of non-approved mating compounds on the shaft–to-yoke mating surfaces was apparently widespread.

On 6 November 2003 the ATSB issued recommendation R20030212 to the operator involved in this occurrence. The recommendation stated that the operator should carry out an inspection of its fleet to determine the extent of the A166 shaft to A907 yoke joint problems outlined in R20030211.

Local Safety Action

Manufacturer

The Manufacturer advised that it would be revising the maintenance manuals and maintenance training courses for the R22 and R44 model helicopters to ensure that the instructions for the assembly of the shaft to yoke joint were clarified.

Operator

Subsequent to receiving recommendation R20030212, the operator advised that it had suspended operations and had recalled its fleet of helicopters to the main operating base for inspection. The operator also advised that it had carried out inspections of their R44 helicopters during that time.

Appendix A

TECHNICAL ANALYSIS REPORT

Report No. 25/03

Task No. BE/200300028

Occurrence No. BO/200304074

Examination of a Fractured Clutch Shaft

Robinson Helicopter Co. R22, VH-UXF

Prepared by:

NR Blyth   Senior Transport Safety Investigator (Technical Analysis)

1. FACTUAL INFORMATION

1.1. Examination brief

On 28 September 2003, Robinson Helicopter Co, R22 (VH-UXF) was involved in an accident during aerial mustering operations near Yakka Munga station in the north of Western Australia. The two occupants of the helicopter were fatally injured. Preliminary on-site investigations found that the drive system clutch shaft had fractured and separated from the main rotor gearbox. The clutch shaft transmits drive power from the engine through to the helicopter main rotor, via the main rotor gearbox and mast assembly (Figure 1).

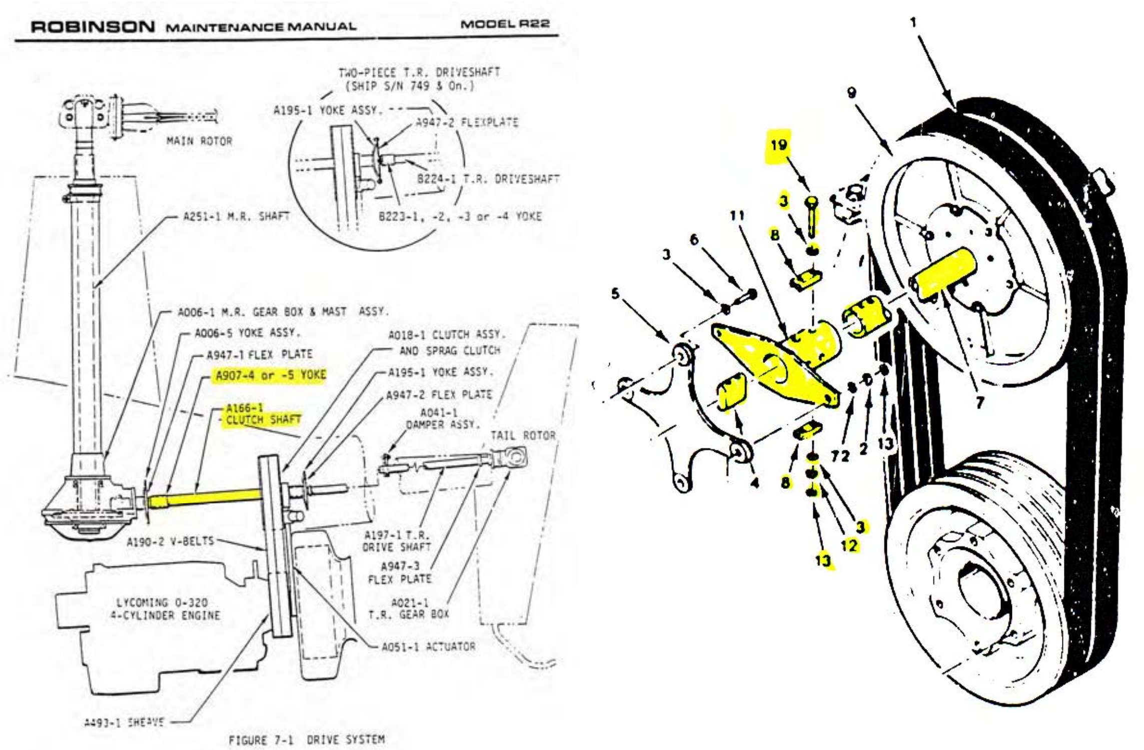

Figure 1. Illustrations of the clutch shaft and yoke components as part of the helicopter's main rotor drive system.

1.2. Samples received

The ATSB Technical Analysis unit received the forward section of the clutch shaft (part number A166-1, serial number 5570), together with the adjoining flex plate yoke (part number A907).

1.3. Disassembly and visual examination

The clutch shaft had fractured at the point of connection to the main rotor gearbox flex-plate yoke (Figure 2). The fracture displayed clear evidence of torsional fatigue cracking, following a spiral path from within the yoke connection that extended around the shaft for approximately 340 degrees over an axial length of around 25 millimetres (Figures 3 & 4). The area of final overload failure represented approximately thirty percent of the overall shaft cross-section and showed mostly ductile shear features.

Figure 2. Clutch shaft, fractured at the point of connection with the flex-plate yoke.

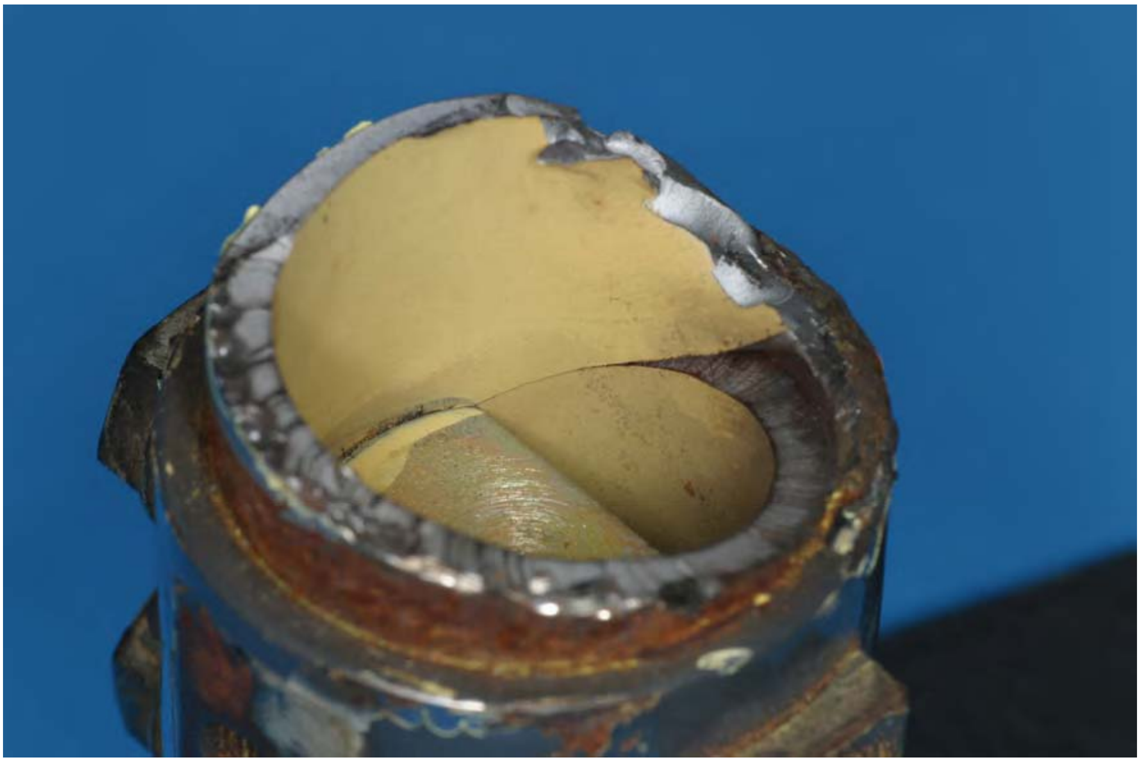

Figure 3. Shaft fracture surface showing the spiral form typical of torsionally induced failures.

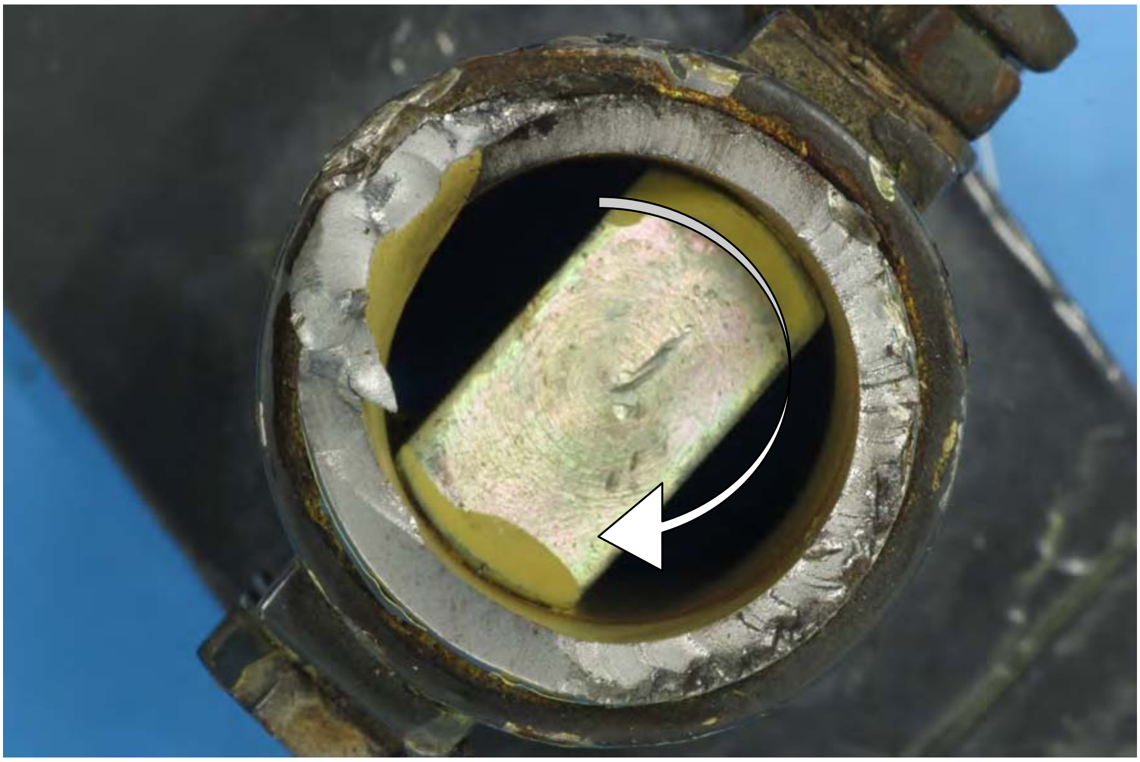

Figure 4. Identifiable crack progression markings (beach marks) on the fracture face indicated the direction of fatigue crack growth (arrow).

Disassembly of the shaft-yoke connection revealed low levels of break-out torque required for both assembly bolts. The inner and outer bolts loosened at torque values of 7 and 4 foot-pounds respectively; markedly below the 20 foot pounds (240 in-lbs) tightening torque that the aircraft maintenance manual specified for the connection.[1] Removal of the bolts and bearing blocks subsequently revealed that the blocks had been installed directly over the painted yoke surface (Figures 5 & 6). Inspections found no indications of any attempt to remove the paint from the block seating locations. Evidence a soft, yellow coloured product between the shaft and yoke (Figure 7) suggested the use of a jointing compound or similar material during the last assembly of the connection.

Figure 5. Removal of the bolt blocks revealed the assembly of the joint over the painted yoke surfaces.

Figure 6. As shown in figure 5, the surfaces of the yoke had not been cleaned of paint before assembly of the clutch shaft connection.

Figure 7. Arrow shows an accumulation of a soft jointing compound within the connection.

Both connection bolt shanks showed fretting and other prominent evidence of loaded contact against the yoke and shaft hole sides (Figure 8). The orientation of the bolt damage indicated that the looseness of the connection had allowed the transmission of shaft torque loads via shear loading of the bolts. Extensive fretting and corrosion of the mating shaft and yoke surfaces found after removing the fractured stub (Figures 9 & 10) provided further evidence of looseness and movement within the connection. Both mating surfaces showed no evidence of the primer coating (Figure 11) specified by the maintenance manual.[2,3]

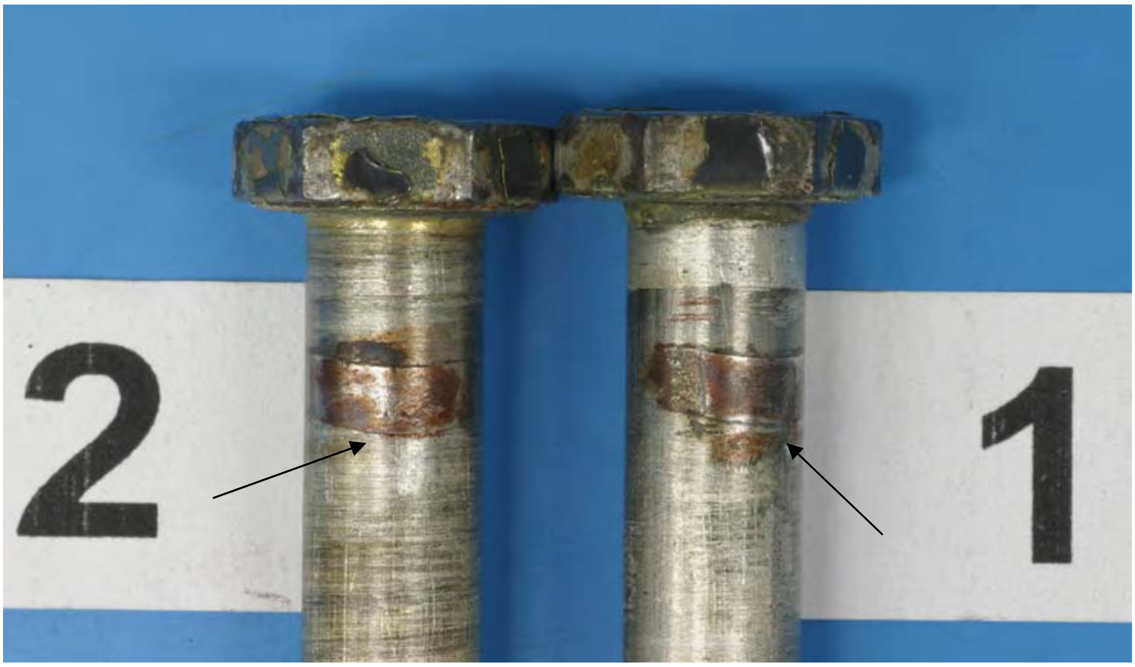

Figure 8. Fretting and wear damage to the bolt shanks, indicating interference with the clutch shaft holes.

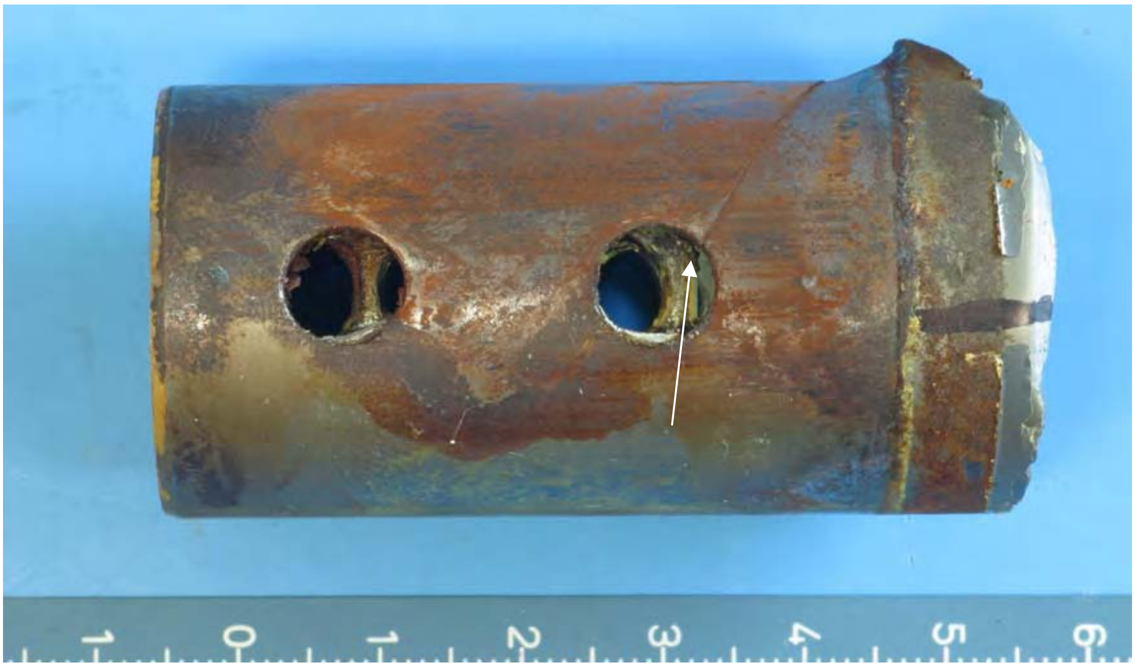

Figure 9. Stub of the clutch shaft removed from the yoke. Crack initiation point shown at the outer bolt hole. Also note the extent of fretting corrosion and damage from the joint movement.

Figure 10. The inside surfaces of the yoke also showed extensive fretting corrosion.

Figure 11. Removing the loose fretting corrosion product revealed the extent of the damage and the absence of any traces of zinc chromate or epoxy primer.

1.4. Fatigue cracking

Initiation of the torsional fatigue cracking had occurred from the bore of the inner shaft bolt hole, at an area of fretting damage similar to the damage on the bolt shank surfaces (Figures 12 & 13). The fretting damage was confined to one side of the hole, and similar damage was also found within the other shaft bolt holes (Figure 14) and the aligning yoke holes.

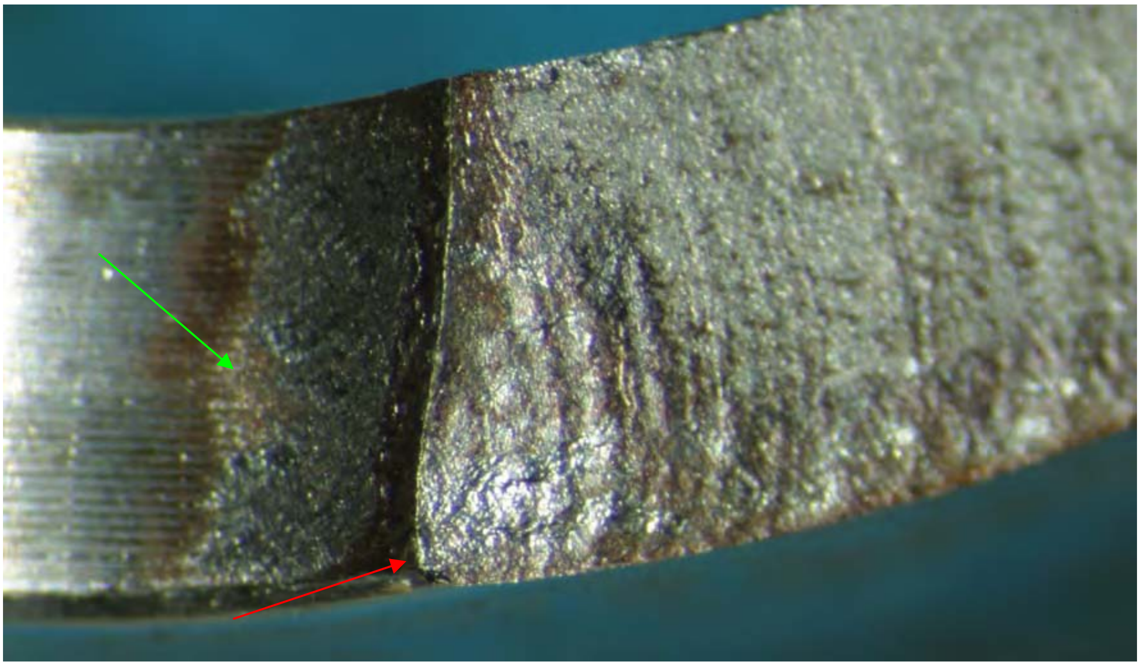

Figure 12. Low-power microscopic view of the fatigue crack origin (red arrow). Note the associated fretting damage on the bore surfaces of the bolt hole (green arrow).

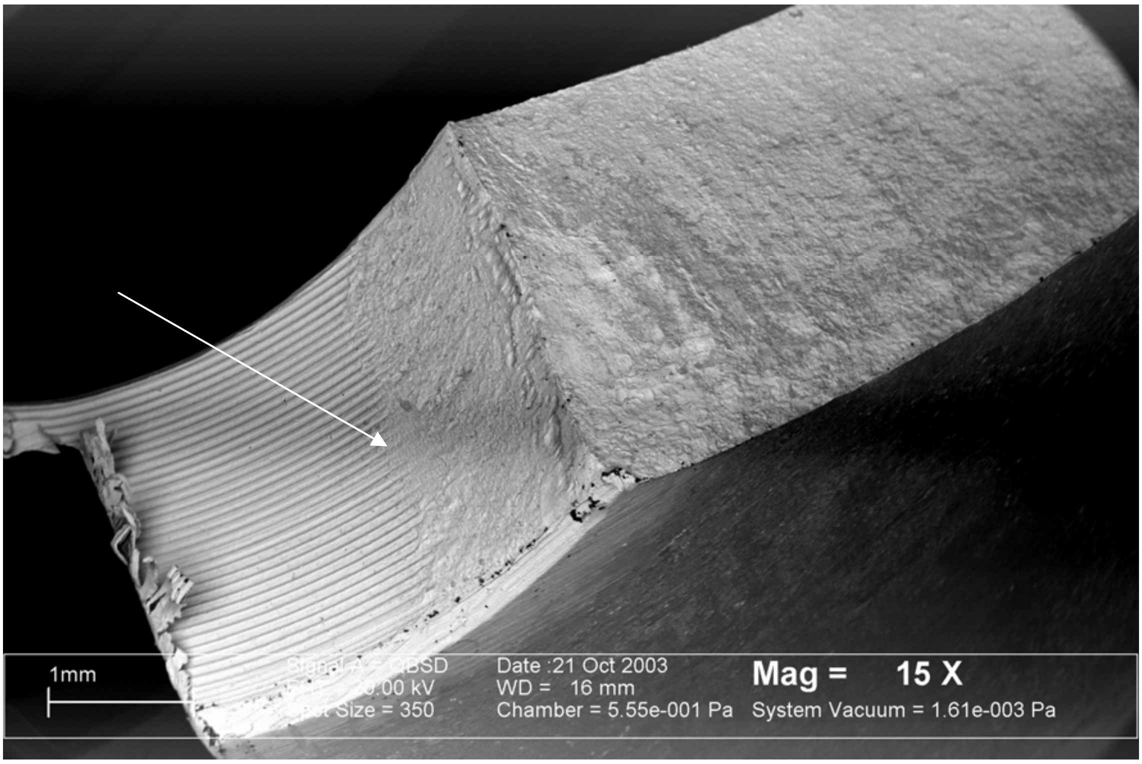

Figure 13. A scanning electron microscope view of the area shown in figure 13. Note how the machining of the bolt hole was disrupted by the fretting damage (arrowed).

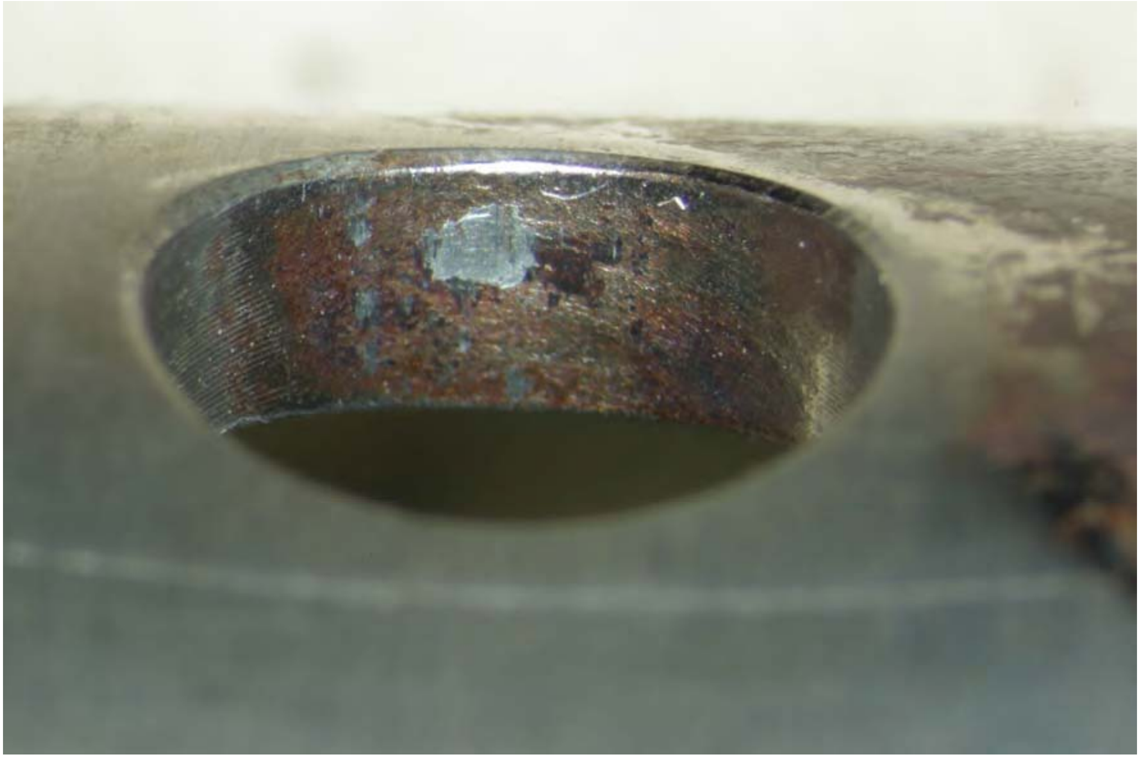

Figure 14. Fretting damage was also found inside the other clutch shaft bolt holes.

1.5. Material examination and analysis

Metallurgically, the clutch shaft material and heat-treatment were sound and complied with the manufacturer's specification for the component.[4] No evidence was found suggesting any contributory deficiencies within the design or manufacture of the clutch shaft.

1.6. Serviceable assembly

A comparable clutch shaft & yoke unit (Figure 15) was obtained from the same aircraft operator and disassembled in the ATSB laboratories. While the yoke surfaces in that case were unpainted and hence the bolt tensions remained higher (evidenced by higher break-out torques), the connection had still been unstable and showed appreciable fretting of the mating surfaces and on the bolt shanks (Figures 16 & 17). The similar, non-hardening jointing compound had been used within the connection in lieu of the prescribed primer coating (Figure 18). Cracking was not found within any of the shaft bolt holes.

Figure 15. A comparable clutch shaft assembly received for comparison with the failed unit.

Figure 16. The surfaces of the clutch shaft from the assembly shown in figure 15. Fretting damage was also clearly evident.

Figure 17. Bolt shanks from the comparison assembly also showed fretting damage and imprints from the hole machining.

Figure 18. A soft jointing compound similar to that found on the failed shaft was observed within the comparison assembly.

1.7. Previous Failure

In 1992, another R22 helicopter sustained a torsional fatigue failure of the A166 clutch shaft, with the aspects of the failure appearing very similar to the case in question.[5] A review of the documentation provided by the Civil Aviation Safety Authority (CASA) concerning that failure [6] confirmed the prior instability and looseness of the shaft-yoke connection as being a factor contributing to the failure. Similar fretting was found over the mating surfaces of the shaft and within the bolt holes. The torsional fatigue cracking had initiated from the same location and propagated to a comparable extent before failure.

A subsequent inspection of the shaft which had been retained for exemplar purposes (Figure 19) also found no evidence of the use of a primer or similar coating over the shaft connection (Figure 20).

Figure 19. Fractured shaft sections from a previous (1992) failure. Note the similarity of the crack origin and propagation path.

Figure 20. Extensive fretting damage was also evident on the interfacial surfaces of the previous clutch shaft failure.

2. ANALYSIS

The A166-1 clutch shaft fitted to VH-UXF had failed as a result of torsional fatigue cracking, originating from the bore of the inner bolt hole used for securing the adjoining drive yoke. The initiation of fatigue cracking was directly attributed to the looseness of the shaft-yoke connection, which allowed the transmission of rotational loads through the connection by shear forces acting on the bolt shanks and transmitted via the bolt holes. The point loading about the holes produced by that behaviour produced a significant stress-raising effect on the localised material structure – sufficient to initiate fatigue cracking under normal shaft loads in the presence of the associated fretting and corrosion damage.

Under normal intended security of the connection, rotational forces are transmitted uniformly via the friction between the shaft and yoke surfaces. Security of the connection is established by adequate bolt tension and the assembly of the connection with a curing or drying primer. Corrosion protection is also assured with the use of the approved primer/s.

The assembly of the yoke-shaft connection without first cleaning away the paint from underneath the block seating locations was considered a major factor in the absence of sufficient bolt tension and hence the loss of clamping force within the connection. The compressibility/conformability of most paint coatings allows applied bolt tension to be progressively lost and hence renders such coatings unsuitable for use within stable, load bearing bolted connections.

The assembly of the yoke-shaft connection with the use of a jointing or similar compound in lieu of the specified primer/s was also held as a factor contributing to the looseness of the connection. The oily, anti-friction properties shown by the compound would have acted to reduce the surface friction within the connection – thus increasing the loads transmitted through the bolts and bolt holes. The non-drying properties of the compound also prevented the effective ‘lock-up’ of the connection when assembled, allowing the surface movement, fretting and bolt interference.

3. CONCLUSIONS

3.1. Significant factors

The ATSB analysis of the failed clutch shaft from VH-UXF identified the following factors as contributory to the failure.

- At the last installation, the P/N A166 clutch shaft was assembled with the P/N A907 yoke using a soft jointing compound in lieu of the zinc chromate or epoxy primer specified by the aircraft manufacturer.

- At the last installation, the clutch shaft – yoke connection was assembled with the external bolting blocks placed over the painted yoke surfaces.

- The movement of the connection under applied torsional loads created point loading within the shaft bolt holes, producing fretting damage and creating localised stress conditions conducive to the initiation of fatigue cracking.

- Growth of fatigue cracking occurred beneath the yoke sleeve, preventing visual identification until the cracking was well advanced and near to critical size.

3.2. References

[1] Robinson Helicopter Company, Maintenance Manual, Model R22 (Change 17, 31 Dec 98) Section 1.320 ‘Standard Torques’, NAS6600 series bolts.

[2] Robinson Helicopter Company, Maintenance Manual, Model R22 (Change 18, 3 Mar 99) Section 7.270 ‘Installation’, part b.

[3] Robinson Helicopter Company, Maintenance Manual, Model R22 (Change 17, 31 Dec 98) Section 1.450 ‘Primers’

[4] Robinson Helicopter Company, Manufacturing records for A166-1 shaft, S/N 5570 and others.

[5] Bureau of Air Safety Investigation (ATSB) occurrence number 199201139, VH-HFP, 19 June 1992.

[6] Civil Aviation Authority, Specialist Report 19-93.

Australian Government
Australian Transport Safety Bureau

Media Release

13 October 2004
2004/32

Mechanical failure led to fatal helicopter crash

The ATSB final investigation report into the crash that killed the two occupants of a Robinson R22 helicopter at Yakka Munga Station in Western Australia, has found that a drive shaft to the main rotor blades failed.

Examination of the shaft revealed that it had failed as a result of a fatigue crack that initiated at a bolt hole in the shaft. Inappropriate procedures, including use of an unapproved sealant, were used when the shaft was last assembled.

During the investigation, the ATSB issued an urgent safety recommendation to the Civil Aviation Safety Authority (CASA) asking for an inspection of the R22 and R44 Australian helicopter fleet. CASA responded by mandating inspections of the shaft assembly to look for signs of damage and to remove those from service that had been assembled using an unapproved sealant.

As a result of the CASA mandated inspections, the use of unapproved sealants was found to be widespread within the Australian R22 helicopter fleet. The Robinson Helicopter Company advised that maintenance documents and training courses would be revised to clarify shaft assembly instructions.

The investigation also found that the survivability of the two occupants may have been adversely affected by the reduced capacity of the seat structures to deform as designed. That was due to the stowage of an excessive amount of baggage and equipment in the underseat baggage compartments.

The full investigation report (200304074) is available from the ATSB website www.atsb.gov.au, or from the Bureau on request.

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