

MINISTRY OF NATIONAL DEVELOPMENT TRANSPORTATION SAFETY BUREAU OF HUNGARY

FINAL REPORT

2014-102-4P Serious Incident

Szombathely Airfield (LHSY) 29 March 2014

Piper PA-38-112 Tomahawk HA-APW

The sole objective of the technical investigation is to reveal the causes and circumstances of aviation accidents and incidents, to initiate the necessary technical measures and to make recommendations in order to prevent similar cases in the future. It is not the purpose of this activity to apportion blame or liability.

INTRODUCTION

This investigation was carried out on the basis of

- Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC,
- Act XCVII of 1995 on aviation,
- ICAO Annex 13 identified in the Appendix of Act XLVI. of 2007 on the declaration of the annexes to the Convention on International Civil Aviation signed in Chicago on 7th December 1944,
- Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents (hereinafter referred to as Kbvt.),
- Decree No. 123/2005. (XII. 29.) of the Minister of Economy and Transport on the rules of technical investigation of aviation accidents and incidents and other occurrences,
- NFM Regulation 70/2015 (XII.1) on technical investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In absence of other relevant regulation in the Kbvt., in accordance with Act CXL of 2004 on the general rules of administrative authority procedure and service.

The competence of the Transportation Safety Bureau of Hungary is based on Government Decree No. 278/2006 (XII. 23.), and, as from 01 September 2016, on Government Decree No. 230/2016. (VII.29.) 23) on assignment of a transportation safety organisation and on the dissolution of Transportation Safety Bureau with legal succession.

Under the aforementioned regulations

- The Transportation Safety Bureau of Hungary shall investigate aviation accidents and serious aviation incidents.
- The Transportation Safety Bureau of Hungary may investigate aviation incidents and irregularities which in its judgement would have resulted in accidents in other circumstances.
- The Transportation Safety Bureau of Hungary is independent of any person or entity which may have interests conflicting with the tasks of the investigating organization.
- In addition to the aforementioned laws, the ICAO Doc 9756 and the ICAO DOC 6920 Manual of Aircraft Accident Investigation are also applicable.
- This Final Report shall not be binding, nor shall an appeal be lodged against it.

Incompatibility did not stand against the members of the IC. The persons participating in the technical investigation did not act as experts in other procedures concerning the same case and shall not do so in the future.

The IC shall safe keep the data having come to their knowledge in the course of the technical investigation. Furthermore, the IC shall not be obliged to make the data – regarding which the owner of the data could have refused its disclosure pursuant to the relevant act – available for other authorities.

DEFINITIONS AND ABBREVIATIONS

AAIB	Air Accident Investigation Branch
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AMOC	Alternative Method of Compliance
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration (USA)
GKM	Ministry of Economy and Transport (Hungary)
ICAO	International Civil Aviation Organization
IC	Investigating Committee
Kbvt.	Act CLXXXIV of 2005 on the technical investigation of aviation, railway and marine accidents and incidents and other transportation occurrences
LT	Local Time
MND	Ministry of National Development (Hungary)
NKH LH	National Transport Authority Aviation Authority (till 31 12 2016) (Hungary)
NTSB	National Transportation Safety Board (USA)
P/N	Part Number
SB	Service Bulletin
SEP (land)	Single Engine Piston Airplane (land)
TMG	Touring Motor Glider
TSB	Transportation Safety Bureau of Hungary

BRIEF DESCRIPTION OF THE OCCURRENCE

Occurrence category		Serious incident
	Class	Fixed wing aircraft
	Manufacturer	Piper Corporation, USA
Aircraft	Туре	Piper PA-38-112 Tomahawk
	Registration mark	HA-APW
	Operator	Avia-Rent Kft.
0.000	Date and time (Local Time)	29 March 2014, 11:00 a.m.
Occurrence	Location	Szombathely Airfield (LHSY)

The airplane was significantly damaged in the incident, but no one was injured.

Reports and Notifications

The occurrence was reported to the dispatcher of TSB by the flight safety service of the operator at 11:43 a.m. on 29 March 2014.

TSB Hungary notified:

- the person on duty at National Transport Authority Aviation Authority (Hungary) on 29 March 2014,
- National Transportation Safety Board (USA), on 01 April 2014,
- European Aviation Safety Agency (EASA), on 01 April 2014.

Investigating Committee

The Head of TSB assigned the following Investigating Committee (hereinafter: IC) for the investigation of the occurrence:

Investigator-in-Charge	Ferenc Kamasz	Accident Investigator
Member	Gábor Erdősi	Accident Investigator

Overview of the investigation

- After receiving the notification of the incident, the IC performed on-site investigation, during which photos were taken of the aircraft, as well as of the documents of the pilot and the aircraft. The IC also interviewed the pilot.
- The IC informed NTSB and EASA on the fact of the occurrence.
- The IC inspected the broken surface of the broken attach bolt of the right main gear of the aircraft.
- NTSB sent to TSB the Service Bulletins No. 673B and No. 1200 relating to the landing gears of the type Piper PA-38-112 aircraft.
- Upon request from the IC, the operator of the aircraft sent TSB the data necessary for the investigation.
- The IC studied Airworthiness Directives relating to the type Piper PA-38-112 aircraft on the website of FAA, and the Service Bulletins on the website of Piper Aircraft Inc..
- The IC performed an analysis of the course of events.
- On 16 November 2016, the IC reviewed the technical documentation of the airplane at the premises of the operator.

- TSB Hungary sent the Draft Report on the investigation to the NTSB, the Hungarian civil aviation authority and the airplane operator on 20 February 2018.
- The organisations answered they had no proposal for modification to the Draft Report.

<u>Synopsis</u>

The pilot took off with the airplane with Registration mark HA-APW from Szombathely Airfield on 29 March 2014 at 10:35 a.m. The flight took place at daylight, in good visibility conditions. The airplane landed on Runway 34 of Szombathely Airfield at 10:56 a.m. Both the flight and the landing were all right. After touchdown deceleration, the pilot turned the airplane to the left in order to taxi from the runway to the apron.

Following a short taxi at low speed, the airplane suddenly leaned to the right, the right wingtip touched the ground, then the airplane turned around the right wingtip, and then came to a full stop (Figure 1).

The airplane was seriously damaged in the event (see in detail in Section 1.3), but no one was injured.

The IC found during the investigation that both the pilot and the airplane had had the required licences and certificates at the time of the event.

The IC found that the right main landing gear of the airplane had detached from the airplane during taxi due to fatigue fracture of an attach bolt.

The IC inspected the main landing gear fastener parts specified in the Service Bulletins No. 673B and No. 1200 issued by the manufacturer of the airplane.

The IC proposes a safety recommendation to FAA relating to modification of the Airworthiness Directive No. 90-19-03, in which the MND TSB recommends FAA to consider the possibility to modify the Airworthiness Directive No. 90-19-03 which would include the application of the fasteners specified in Service Bulletin No. 1200 instead of those specified in Service Bulletin No. 673B if, on the basis of operating experience, such fasteners have proved more reliable than the earlier versions.

1. FACTUAL INFORMATION

1.1 History of the flight

The pilot took off with the type Piper PA-38-112 Tomahawk airplane with Registration mark HA-APW for a private leisure flight from Szombathely Airfield on 29 March 2014 at 10:35 a.m. (LT). The flight took place at daylight, in good visibility conditions. The airplane landed on Runway 34 of Szombathely Airfield at 10:56 a.m. (LT). Both the flight and the landing were all right. After touchdown deceleration, the pilot turned the airplane to the left in order to taxi from the runway to the apron.

After a taxi of about 200 metres at a speed of 8 to 10 km/h according to the pilot's report, the airplane suddenly leaned to the right, the right wingtip touched the ground, then the airplane turned ca. 45 degrees around the right wingtip, and then came to a full stop (Figure 1). The propeller did not touch the ground. The pilot shut down the engine and shut off the fuel valve.



Figure 1: Position of the airplane after it stopped

The fuel began to leak on the ground through the overflow hose of the right fuel tank due to the lateral tilt position of the airplane (Figure 2).



Figure 2: Fuel tank overflow hose at the bottom of the right wing

Assisted by the people at the airfield, the pilot lifted the right wing of the airplane, almost to the level of the left wing, and supported it (Figure 3). The pilot disconnected the battery power cable from the battery.

Subsequently, the fuel left in the tanks of the airplane was drained into fuel cans.



Figure 3: Airplane position with the right wing supported

1.2 Injuries

Two people were on board of the airplane during the incident; no one was injured.

1.3 Damage to Aircraft

The airplane suffered the following damages during the incident:

- the inner fixing bolt of the right main landing gear ripped, and the main gear turned out from under the airplane,
- the fixing bolt at the front end of the clamp fixing the main gear was ripped off its place when the right main gear turned out,
- the main gear detached from the airplane,
- the composite fairing piece of the linkage of the right main landing gear broke off,
- the brake hose of the wheel of the right main landing gear broke,
- the right flap was deformed,
- the fairing piece of the right wingtip broke,
- the right wing was damaged,
- the lower part of the rudder was slightly deformed.

1.4 Other damage

The IC was not informed on any other damage during the period of the investigation.

1.5 Information on personnel

Details of the pilot-in-command

Age, Nationality, Gender		Aged 66, Hungarian, male	
	Туре	PPL(A)	
	Professional validity until	31 July 2014	
l icense data	Medical validity until	25 January 2015	
License dala	Certificates	Pilot in command (since 16 June 2010)	
	Ratings	SEP(land), TMG	
	Total	114 h / 307 take-offs	
Flight Hours/	in previous 90 days	6 h 17 min / 10 take-offs	
Cycles	in previous 7 days	1 h 09 min / 2 take-offs	
	in previous 24 hours	1 h 09 min / 2 take-offs	

1.6 Aircraft data

1.6.1. General

Class	Fixed wing aircraft	
Manufacturer	Piper Corporation, USA	
Туре	Piper PA-38-112 Tomahawk	
Date of manufacturing	1979	
Serial number	3879A0512	
Registration mark	HA-APW	
State of Registry	Republic of Hungary	
Owner	Sabicon Kereskedelmi és Tanácsadó Kft.	
Operator	Avia-Rent Kft.	

	Flight Hours	Number of landings
Since manufacturing	9 139 h	No data
Since AD 90-19-03 was accomplished (13 March 1991)	1 900 h	No data
Since last periodical maintenance (15 Oct 2013)	33 h	No data

Previous operators of the airplane did not record the number of take-offs performed with the airplane, and the current operators only have had recorded take-off data since 28 June 2006.

1.6.2. Airworthiness

Airworthiness	Number	ARC 004/10/2013
Review	Date of issue	16 October 2013
Certificate (EASA	Valid until	16 October 2014
Form 15b)	Date of last review	16 October 2013

See detailed registration history of the airplane in Section 1.18.1.

1.6.3. Engine data

The piston engine type Lycoming O-234L2C had no effect on the occurrence, therefore it needs no detailed discussion.

1.6.4. Propeller data

The engine propeller had no effect on the occurrence, therefore it needs no detailed discussion.

1.6.5 Aircraft loading data

Two people of average weight were on board during the flight. Based on data available, the IC does not assume that the mass of the airplane exceeded the maximum take-off weight, and, therefore, this parameter needs no detailed discussion.

1.6.6 Faulty system information

The leaf spring of the right landing gear is fastened to the right wing of the airplane using 3 bolts, in such manner that two bolts fasten the landing gear to the wing through a clamp, and the third bolt presses the end of the leaf spring to the wing (Figure 4).

During the event, the head of the bolt fixing the end of the leaf spring of the right main landing gear ripped off, and the right main landing gear wheel moved in the direction of the wing, i.e. upwards relative to the aircraft, due to the weight of the airplane loaded on it. The bent end of the leaf spring of the right main landing gear situated at the wing moved downward, gave a push to the clamp, ripping out its front bolt. The clamp moved away from the wing, and allowed the right main landing gear to twist backward and detach from the aircraft. During such detachment, the composite fairing piece of the linkage of the main landing gear broke off, and the brake tube of the wheel of the main landing gear broke.



Figure 4: Fixing points of the right main landing gear of the airplane

1.7 Meteorological data

The event occurred at daytime, in good visibility conditions, in absence of any mentionable meteorological phenomena.

The weather conditions had no effect on the course of events, therefore they need no detailed discussion.

1.8 Navigation aids

The navigation aids had no effect on the course of events, therefore they need no detailed discussion.

1.9 Communications

The communication equipment had no effect on the course of events, therefore it needs no detailed discussion.

1.10 Airport information

Both take-off and landing took place at Szombathely Airfield.

Szombathely Airfield had a valid operating certificate at the time of the event.

Airfield data:

- ICAO Code: LHSY
- Coordinates of the reference point: N47°16'57", E16°37'35"
- Runway signs: 16, 34
- Runway surface: grass
- Runway dimensions: 1150 metres x 80 metres

1.11 Flight recorders

The airplane type involved in the event is not required to have a flight data recorder in place.

1.12 Wreckage and impact information

The main parts of the airplane remained together during the event, only the right main landing gear and its fasteners were detached from the airplane (Figure 5).



Figure 5: Detached parts of the airplane as found after the event

After the right main landing gear ripped off, the airplane tilted on its right wingtip, as a result if which the fuel began to leak onto the ground through the overflow hose of the fuel tank in the right wing.

Assisted by people at the airfield, the pilot lifted the right wing of the airplane, almost to the level of the left wing, and then they supported it (Figure 3). The pilot disconnected the battery power cable from the battery. The fuel left in the fuel tanks of the airplane was drained into fuel cans.

1.13 Medical and pathological information

No forensic medical investigation was performed relating to the event.

1.14 Fire

Owing to the preventive actions taken, there was no fire after the airplane stopped.

1.15 Survival aspects

No personal injuries occurred.

1.16 Test and investigation methods

The IC did not perform or order tests or inspections.

1.17 Organizational and management information

The characteristics of the organisations affected had no effect on the course of events, therefore they need no detailed discussion.

1.18 Additional information

1.18.1 The airplane has been registered in the following countries:

- in the USA, following its manufacturing,
- in Germany, on 22 March 1994,
- in Hungary, on 28 June 2006.

1.18.2 Actions taken earlier by the manufacturer or any authority relating to the landing gear of the airplane:

On 02 October 1986, the manufacturer of the airplane issued Service Bulletin No. 673B for Piper PA-38-112 Tomahawk, relating to landing gear detachment due to loosened or bent main landing gear attach bolts. This SB replace the landing gear attach bolts and barrel nuts and, as necessary, the saddle clamps by stronger items by incorporating the Piper KIT No. 765-171 or 765-172.

FAA issued Airworthiness Directive No. 90-19-03 effective on 15 October 1990. This AD requires the modification of the main landing gears of type Piper PA-38-112 airplane in accordance with Service Bulletin No. 673B during the maintenance due after 100 Flight hours.

On 29 May 2009, the manufacturer of the aircraft issued Service Bulletin No. 1200 relating to the strengthening of the landing gears of type Piper PA-38-112 Tomahawk airplane. Such SB modifies the bolt joints of the airplane by ordering and incorporating a Piper KIT 88455-002 as follows:

- Replace existing barrel nuts by NAS577B7A barrel nuts (P/N: 506-561) and 02376-002 barrel nuts.

- Replace existing bolts by NAS6606HL15 bolts (P/N: 693-245), and NAS6607H22 bolts (P/N: 693-246).

- Install AN960-716 or AN960-716L washers under the bolt heads.

- Install a 106801-002 retainer under the NAS6607H22 bolt.

- Tighten the bolts using appropriate torque, and then secure the bolt heads using the MS20995C41 safety wire.

On 03 June 2011, FAA Atlanta Aircraft Certification Office (ACO) approved the Alternative Method of Compliance (AMOC) document (Annex 2 hereto) prepared the Piper factory, which allows the owners/operators of the airplane registered in the USA to disregard the parts required in AD 90-19-03, provided that they use the parts listed in Part 1 of Service Bulletin No.1200. However, FAA ACO will revoke such AMOC approval if the ACO later determines that such AMOC does not provide an acceptable level of safety.

1.18.3. Similar occurrences with the airplane type involved:

The IC has information on the following investigations performed by Air Accident Investigation Branch (Great Britain) where the landing gear of this airplane type was involved:

- AAIB investigation No.: 6/85
- AAIB investigation No.: 1/88
- AAIB investigation No.: 12/88
- AAIB investigation No.: 10/89
- AAIB investigation No.: 3/90
- AAIB investigation No.: 10/2007

The cause of the event followed by the investigation AAIB 10/2007 was detachment of one of the 3 bolts which attached the landing gear to the airframe. AD 90-19-03 was already in effect at the time of that event.

1.19 Useful or effective investigation techniques

The investigation did not require techniques different from the conventional method.

2. ANALYSIS

The IC inspected the right main landing gear detached from the airplane, as well as the attach points for the main landing gear at the bottom surface of the right wing (Figures 4 & 6).

The leaf spring of the right main landing gear is attached to the right wing with 3 bolts in such manner that two bolts attach the landing gear to the wing through a clamp, and the third bolt presses the end of the leaf spring to the wing.

Figure 6 shows that one of the two bolts of the aforesaid clamp has ripped out, while the head of the inner bolt is missing.

The IC inspected the attach hole for the right main landing gear, but it showed no sign of irregular wear or damage.



Figure 6: Bolt joints of the right main gear after the event (as viewed backward from the leading edge of the wing)

On the basis of the findings of the investigation of the scene and the information revealed during the investigation, the position of the IC is that the chronological order of malfunction of the landing gear was as follows:

- 1. First, the head of the attach inner bolt of the right main landing gear ripped off;
- 2. due to the weight of the airplane, the wheel of the right main landing gear moved toward the wing, i.e. upward relative to the airplane;
- 3. the bent end (situated at the wing) of the leaf spring of the right main landing gear moved downward, pushed the clamp, and ripped its front attach bolt out;
- 4. the clamp moved away from the wing, allowing the right main landing gear to move backward and away from the airplane;
- 5. the displaced main landing gear broke the fairing piece off the wing;
- 6. while the landing gear strut was moving away from the airplane, the brake tube of the right wheel broke;
- 7. the right main landing gear detached from the airplane.

Figures 7 & 8 show the broken head of the damaged bolt. Corrosion marks can be seen in the central part of the broken surface (Zone 1). The right part of the broken surface in Figure 7 is bright, which indicates fatigue fracture (Zone 2).



Figures 7 & 8: The broken-off head of the attach bolt of the right main gear

The IC inspected the SBs issued earlier for the airplane type Piper PA-38-112 Tomahawk, as well as the AD.

The landing gear of the type Piper PA-38-112 Tomahawk airplane have already been involved in occurrences where the main gear attach bolts got loose or elongated as an effect of repeated loads, and the head of the loose bolt suffered repeated hits from the leaf spring during landing and taxi on the runway, which then caused fatigue fracture of the bolt and detachment of the main landing gear with time.

On 02 October 1986, in order to prevent similar events, the manufacturer of the airplane issued the Service Bulletin 673B which allows replacing of the main landing gear attach elements by stronger ones by incorporating the manufacturer's KIT No. 765-171 or 765-172.

Federal Aviation Authority (FAA), which supervises the manufacturer of the airplane, issued Airworthiness Directive No. 90-19-03 effective on 15 October 1990. It requires the modification of the attach of the main landing gears of each type Piper PA-38-112 airplane by the operator in accordance with the Service Bulletin No. 673B during the maintenance due after 100 flight hours.

The affected airplane was subject to the modification required in AD 90-19-03 under its previous registration mark and under supervision by its previous operator on 13 March 1991 when the landing gear attach elements were replaced by incorporating the manufacturer's KIT 765-171.

The number of flight hours of the airplane was 7239 when the AD was accomplished. The previous operator did not record the number of flight cycles of the airplane (see: 1.6.1.). The airplane malfunctioned on 29 March 2014. The right main landing gear of the airplane parted due to fatigue fracture of an attach bolt. The bolt was in service for 23 calendar years, during which period it served 1900 flight hours.

No information is available relating to the exact number of landings of the airplane, it may only be estimated on the basis of the flight hours. Supposing that, on average, a landing comes after 20 to 40 minutes of flight, then the given period of time included 2850 to 5700 landings by the airplane when, finally, the head of an attach bolt of the main landing gear broke.

On 29 May 2009, the manufacturer of the airplane issued its Service Bulletin No. 1200 relating to strengthening of the landing gear of the airplane type Piper PA-38-112 Tomahawk (See attached in Annex 1). Such SB modifies the bolt joints of the landing gear of the airplane by ordering and incorporating of the Piper 88455-002 KIT as follows (Figure 9):

- Replace the barrel nuts by NAS577B7A (P/N: 506-561) and 02376-002 barrel nuts;
- Replace the bolts by NAS6606HL15 (P/N: 693-245) and NAS6607H22 (P/N: 693-246) bolts;
- Install AN960-716 or AN960-716L washers under the bolt heads;
- Install a 106801-002 retainer under the NAS6607H22 bolt;
- Tighten the bolts using appropriate torque, and then secure the bolt heads using the MS20995C41 safety wire.



Figure 9: Fixing of the landing gear according to the Piper 1200 Service Bulletin

On 03 June 2011, FAA Atlanta Aircraft Certification Office (ACO) approved the Alternative Method of Compliance (AMOC) document (see Annex 2 hereto) prepared the Piper factory, which allows the owners/operators of the airplane registered in the USA to disregard the parts required in AD 90-19-03, provided that they use the parts listed in Part 1 of Service Bulletin No. 1200. However, FAA ACO will revoke such AMOC approval if ACO later determines that such AMOC does not provide an acceptable level of safety.

Inspecting the documentation of the airplane, the IC found no sign of any modification of the bolt joints of the landing gear of the airplane performed on the basis of the Piper Service Bulletin No. 1200.

Inspecting the broken-off bolt head, the IC found that it had no holes for the safety wire, i.e. the attach bolt incorporated in the airplane was surely not the one shown with Item No. NAS6607H22 in Figure 9.

In the opinion of the IC, the risk of detachment of the main landing gear could have been reduced by applying the stronger main gear fasteners developed by the Piper Aircraft Inc. and by performing the maintenance specified in Part III of the Piper Service Bulletin No. 1200, and for this reason, the IC proposes a safety recommendation to FAA relating to the modification of AD No. 90-19-03.

3. CONCLUSIONS

3.1 Factual findings

At the time of the event, the pilot had the appropriate ratings, certificates and experience for the given flight task. The flight was performed in accordance with the rules and regulations in effect.

The airplane had a valid Airworthiness Review Certificate and a valid Airworthiness Certificate. According to its documentation, it was equipped and maintained in compliance with effective requirements and accepted procedures.

AD No. 90-19-03 relating to replacement of the fasteners of the landing gear was performed for the airplane on 13 March 1991 by incorporating the parts in the KIT with Part Number 765-171.

The previous operator did not record the number of flight cycles of the airplane.

The total weight and the weight distribution of the airplane were within the specified limits.

The airplane was filled up with sufficient fuel for the flight.

The flight took place in good visibility conditions, at daylight.

No such information emerged relating to the activity of the ground handling personnel which could be associated with the occurrence.

3.2 Causes of the event

As a result of the investigation, the IC concluded that the occurrence had the following causes:

- The head of the inner attach bolt of the right main landing gear fractured while the airplane was moving on ground, and the broken surface showed the signs of fatigue of the material.
- The bent end of the leaf spring of the right main landing gear situated at the wing moved downward, gave a push to the clamp, ripping out its front bolt.
- The clamp moved away from the wing, which allowed the right main landing gear to twist backward and detach from the airplane.

Contributing factors:

- The landing gear attach elements applied in the airplane were not the stronger ones specified in Service Bulletin No.1200 but those specified in Service Bulletin No. 673 which were mandatorily required by Airworthiness Directive No. 90-19-03.
- The airplane was regularly operated on an airfield with grass cover where the landing gear of the airplane may occasionally be exposed to larger loads during taxiing, takeoff and landing than in the case of operation on an airfield with asphalt or concrete surfaces.

4. SAFETY RECOMMENDATION

4.1 Recommendations issued during the investigation by the Operator

For financial considerations, the owner does not intend to render the airplane serviceable again after the event.

4.2 Recommendations issued during the technical investigation

MND TSB issued no safety recommendation during the investigation.

4.3 Recommendations issued after the technical investigation

Ministry of National Development Transportation Safety Bureau of Hungary is issuing the following safety recommendation simultaneously with the closing of the investigation:

BA2014-102-4P-1 During the investigation, the Investigating Committee of Transportation Safety Bureau found that the cause of detachment of the right main gear of the type Piper PA-38-112 Tomahawk aircraft involved in the event was a fatigue fracture of the attach bolt located at the end of the leaf spring of the main gear.

Ministry of National Development Transportation Safety Bureau of Hungary, recommends Federal Aviation Authority (FAA) to consider the possibility of application of the fasteners specified in Service Bulletin No.1200 instead of those specified in Service Bulletin No.673B relating to the landing gear of the type Piper PA-38-112 airplane, based on experiences gained from operation. In the case that the landing gear of the type Piper PA-38-112 airplane is judged more reliable with the parts specified in Service Bulletin No.1200 than the earlier solution, then FAA is proposed to consider the possibility to modify Airworthiness Directive No. 90-19-03 in accordance with Service Bulletin No.1200.

In the case of accepting and implementing this Safety Recommendation, the bolt joints of the main gears of the type Piper PA-38-112 aircraft will be replaced by stronger ones, and subsequently the risk of similar events will significantly decrease, according to the position of the Investigating Committee.

Budapest, 22 May 2018

Gábor Ērdősi IC Member

Ferenc Kamasz Investigator-in-Charge

ANNEXES:

Annex 1: Piper Service Bulletin No.1200

Piper Aircraft, Inc. 2926 Piper Drive Vero Beach, Florida, U.S.A.	32960 SERVICE NO. 1200 BULLETIN PIPER CONSIDERS COMPLIANCE MANDATORY Date: May 29, 2009 (S)
SUBJECT:	LANDING GEAR MODIFICATION AND HARDWARE REPLACEMENT
MODELS AFFECTED:	SERIAL NUMBERS AFFECTED:
PA-38-112 Tomahawk	38-78A0001 through 38-82A0122
COMPLIANCE TIME:	 PART I – LANDING GEAR MODIFICATION: To take place at the first occurrence of any one of the following events: 1. The next regularly scheduled maintenance event but not to exceed one hundred (100) hours time in service. 2. Immediately after a known hard landing is made. 3. Immediately after a landing is made while the aircraft is known to exceed the design landing weight. Compliance with PART 1 is a one time only requirement. PART II – LANDING GEAR HARDWARE INSPECTION: To occur periodically after completion of PART I, at a maintenance interval frequency not to exceed one hundred (100) hours time in service. PART III – LANDING GEAR HARDWARE REPLACEMENT: To occur periodically after completion of PART I, at a maintenance interval frequency not to exceed one hundred (100) hours time in service, or after a known hard landing is made, or after a landing is made while the aircraft is known to exceed the design landing weight.
APPROVAL:	The technical content of this Service Bulletin has been shown to comply with the applicable Federal Aviation Regulations and is FAA approved.
PURPOSE:	An examination of the Tomahawk aircraft service history reveals that the bolts securing the main landing gear to the airframe can bend or break when subjected to repeated high loading conditions, resulting in landing gear failure. This service bulletin mandates a one-time modification to allow installation of higher strength bolts, and establishes maintenance schedules for recurring inspection and replacement of the landing gear attach bolts.
	(OVER)
	ATA: 3207

SERVICE BULLETIN NO. 1200

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INSTRUCTIONS:

PART I - LANDING GEAR MODIFICATION:

- Order and install "KIT PA38 LANDING GEAR HARDWARE REPLACEMENT", Piper part number 88455-002, one per aircraft. This kit provides parts and instructions for installing replacement hardware that fasten the main landing gear to the airframe.
 - NOTE: Verify compliance with Piper Service Bulletin 673 (latest revision) prior to installing 88455-002.
- 2. Make an appropriate logbook entry indicating compliance with Part I of this Service Bulletin.

PART II - LANDING GEAR HARDWARE INSPECTION:

- Place aircraft on jacks. Refer to Piper Maintenance Manual "TOMAHAWK MAINTENANCE MANUAL PA-38-112, Piper part number 761-660, Chapter 7, "LIFTING AND SHORING".
- Remove main landing gear fairings to gain access to the landing gear attach bolts, and retain fairings and fairing mounting hardware for reinstallation.
- Remove safety wire from the landing gear attach bolts (quantity 3 per side, total 6 per aircraft) and discard. Check bolts for proper torque as shown in Figure 1.
- 4. Install new safety wire (MS20995C41), reinstall fairings, and remove aircraft from jacks.
- 5. Make an appropriate logbook entry indicating compliance with Part II of this Service Bulletin.

PART III - LANDING GEAR HARDWARE REPLACEMENT:

- Place aircraft on jacks. Refer to Piper Maintenance Manual "TOMAHAWK MAINTENANCE MANUAL PA-38-112, Piper part number 761-660, Chapter 7, "LIFTING AND SHORING".
- Remove main landing gear fairings to gain access to the landing gear attach bolts, and retain fairings and fairing mounting hardware for reinstallation.
- Remove safety wire from the landing gear attach bolts and discard. Remove the bolts from the aircraft and discard (quantity 3 per side, total 6 per aircraft), taking care to note and record the existing stack-up of shims and washers. Remove and discard existing NAS577B7A barrel nuts (quantity 1 per side, total 2 per aircraft).
- 4. Install new replacement hardware, as shown in Figure 1 and as listed in Materials Required Table 4. All other components that are free of damage or corrosion may be re-used at their original locations. Torque bolts according to the following procedure:
 - a) Draw up pairs of NAS6606HL15 bolts evenly, 1 or 2 turns maximum per bolt, alternating back and forth until bolts are snug. Install (1 each side) NAS6607H22 bolt, and tighten until snug. Torque should build up gradually for all bolts. An abrupt buildup indicates threads are bottoming in the barrel nut.
 - b) With all bolts installed and snug, torque the (2 each side) NAS6606HL15 bolts 160 to 200 inch-pounds, and torque the (1 each side) NAS6607H22 bolts 270 to 300 inch-pounds. Examine bolt thread penetration during and after torquing.
 - For the (2 each side) NAS6606HL15 bolts, the end of bolt must be at least flush with barrel nut after torquing. If bolt extends into clearance hole, or threads bottom out as described above, add additional AN960-616 or AN960-616L washer under bolt head to achieve proper bolt grip. The saddle clamp and shim should fit snugly against the wing. See Table 1 for interchangeability with NAS1149 washers.
 - For the (1 each side) NAS6607H22 bolts, at least one complete bolt thread must protrude visibly through the barrel nut after torquing. If bolt extends into clearance hole, or threads bottom out as described above, add additional AN960-716 or AN960-716L washer under bolt head to achieve proper bolt grip. See Table 1 for interchangeability with NAS1149 washers.

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INSTRUCTIONS: (Continued)

- c) Safety all six bolts with MS20995C41 safety wire as follows: Safety wire each (2 per side) NAS6606HL15 bolt head to the adjacent hole in the saddle clamp web (as previously safety wired), and safety wire the (1 per side) NAS6607H22 bolt head to the adjacent hole in the outboard flange of the 106801-002 RETAINER (as previously safety wired).
- 5. Reinstall fairings, and remove aircraft from jacks.
- 6. Make an appropriate logbook entry indicating compliance with Part III of this Service Bulletin.

Inactive Part Number	Replacement Part Number
AN960-616L	NAS1149F0632P
AN960-616	NAS1149F0663P
AN960-716L	NAS1149F0732P
AN960-716	NAS1149F0763P

Table I Interchangeability

The AN960 series washers were installed at the factory, and remain acceptable for continued use. However, AN960 washers are inactive for new design, so service spares replacements may not be readily available. The table above specifies the replacement NAS1149 washers that can be used interchangeably with the AN960 washers.



For parts not identified refer to the latest revision of the Illustrated Parts Catalog (P/N 761-659).

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MATERIAL REQUIRED:

Materials Required for Compliance with Part I			
QTY	QTY PIPER ITEM NAME PART NUMBER		
1	88455-002	KIT – PA38 LANDING GEAR HARDWARE REPLACEMENT	

TABLE 2

	Ma	terials Required for	or Compliance with Part II	
QTY	PIPER PART NUMBER		ITEM NAME	
A/R	Procure locally	MS20995C41	SAFETY WIRE	

TABLE 3

	Ma	terials Required for	Compliance with Part III	
QTY	PIPER PART NUMBER	ITEM NAME		
A/R	Procure locally	MS20995C41	SAFETY WIRE	
4	693-245	NAS6606HL15	BOLT	
2	693-246	NAS6607H22	BOLT	
2	506-561	NAS577B7A	BARREL NUT	

TABLE 4

AVAILABILITY OF PARTS: Your Piper Service Facility.

EFFECTIVITY DATE: This Service Bulletin is effective upon receipt.

- <u>SUMMARY:</u> Please contact your Factory Authorized Piper Service Facility to make arrangements for compliance with this Service Bulletin in accordance with the compliance time indicated.
 - NOTE: Please notify the factory of address/ownership corrections. Changes should include aircraft model, serial number, current owner's name and address.

Corrections and/or changes should be directed to:

PIPER AIRCRAFT, INC. Attn: Customer Service 2926 Piper Drive Vero Beach, FL 32960

Annex 2: Approval of the Alternative Method of Compliance (AMOC) relating to the Service Bulletin No.1200



U.S. Department of Transportation Federal Aviation Administration Small Airplane Directorate Atlanta Aircraft Certification Office 1701 Columbia Ave. College Park, Georgia 30337

June 3, 2011

Jack Mill, ODA administrator Piper Aircraft, Inc. 2926 Piper Drive Vero Beach, Florida 32960

Dear Mr. Mill:

The Federal Aviation Administration (FAA) received your letter dated May 23, 2011, proposing an alternative method of compliance (AMOC) to paragraph (a) of Airworthiness Directive (AD) 90-19-03 for all Piper Model PA-38-112 aircraft. This AD requires owners/operators to modify the main landing gear system in accordance with Piper Service Bulletin (SB) 673B dated October 2, 1986, by incorporating kit 765-171 or 765-172.

Part I of Piper SB 1200 dated May 29, 2009, provides an alternate configuration via kit 88455-002 to those shown in SB 673B as shown in the table below.

Item	SB 673B	SB 1200
Bolt	AN6H-14A	NAS6606HL15
Washer	AN960-616	AN960-616, -616L or NAS1149F
Torque (in-lb)	240-270	160-200

Your letter proposed SB 1200 as an AMOC to AD 90-19-03. We have reviewed SB 1200 (which verifies compliance with SB 673 latest revision, along with the specifications for the bolts and washers listed above.

The Atlanta Aircraft Certification Office (ACO) approves your AMOC proposal to paragraph (a) of AD 90-19-03 using the alternate configuration from Part I of SB 1200 listed in the table above in lieu of the configuration required by SB 673B. All provisions of AD 90-19-03 that are not specifically referenced above remain fully applicable and must be complied with accordingly. This AMOC does not incorporate any additional requirements of SB 1200 into the AD. Please include a copy of this AMOC when distributing SB 1200.

Before using this AMOC, owners/operators should notify their appropriate principal inspector (PI) in the FAA Flight Standards District Office (FSDO), or lacking a PI, their local FSDO. When complying or verifying compliance with AD 90-19-03 using this AMOC, a copy of this letter shall be inserted into the maintenance records of the airplane.

The AMOC approval applies to all Piper PA-38-112 aircraft. This FAA AMOC is transferable with the aircraft to an owner/operator who operates the aircraft under U.S. registry. The ACO will revoke

this AMOC if the ACO later determines that this AMOC does not provide an acceptable level of safety.

If you have any questions or need additional information, please contact Gregory K. (Keith) Noles at (404) 474-5551, (404) 474-5606, or electronic mail at gregory.noles@faa.gov.

Sincerely,

H

Melvin D. Taylor, Manager, Atlanta Aircraft Certification Office

cc: ACE-100 ACE-113 (Showers/Wessley) ACE-MKC-AEG-11 (Alquist)

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