RNSA

Rannsóknarnefnd samgönguslysa

Final Report on aircraft accident

Case no: **M-03114/AIG-23**

Date: **28. August 2014**

Location: **Road 35 in Mosfellsdalur, near Helgafell**

Description: **Loss of engine power and emergency landing**

1. FACTUAL INFORMATION

Location and time	
Location:	Road 35, about 0.5 km from Road 1, in Mosfellsdalur near Helgafell (64°10‘ 42.96‘‘ N and 021°40‘ 8.51‘‘ W)
Date:	August 28th 2014
Tíme[1]:	18:30

Aircraft	
Type:	Xair-F
Registration:	TF-142
Year of manufacture:	2013
Serial number:	1050
Engine:	One, 70 HP Hirth 3503E18H piston engine
CofA[2]:	Valid Airworthiness Certificate, issued by the Reykjavik Ultralight club[3]

Other information	
Type of flight:	Private ultralight
Persons on board:	Two
Injuries:	None
Damage to aircraft:	Moderate damage
Short description:	The ultralight lost engine power during flight and an emergency landing was made

Pilot		
Age:	63 year old	
License:	Holder of a valid ultralight license, issued by the Icelandic Transportation Authority	
Ratings:	Three-axis ultralight with passenger	
Medical certificate:	2. class, valid	
Flight experience:	Total hours:	65.1 flight hours
	Total hours on type:	65.1 flight hours
	Last 90 days:	25.4 flight hours
	Last 24 hours:	0.2 flight hours

[1] All times in the report are UTC and where applicable local times are shown in ( )
[2] Certificate of Airworthiness
[3] Fisfélagi Reykjavíkur

At 18:15 on August 28th 2014 an ultralight pilot took off from the ultralight air strip at Úlfarsfell. After less than 15 minutes of flying the ultralight's engine lost power. At this time the ultralight was flying at low altitude along Road 35 in Mosfellsdalur, near Helgafell about 0.5 km from Road 1. The pilot looked for a possible landing site and noticed a gravel road extending out from Road 35. As the ultralight was about to glide across Road 35 on its way to the emergency landing site, its left wing hit a light pole. The ultralight turned 180° and came to rest in the middle of Road 35 (64°10' 42.96'' N and 021°40' 8.51'' W). See Figure 1.

Figure 1: TF-142 at the accident site

Ultralight TF-142 was equipped with one 70 HP Hirth 3503E18H piston engine with dual ignition and fuel injection system. During the ITSB[4] investigation the spark plugs were found damaged and the engine heads were burned. See Figure 2 and Figure 3. The pilot had changed the spark plugs prior to the flight. The pilot had purchased "NGK BR 8 ES" as the new replacement spark plugs, using Table 4.1 in the engine's Operator's Manual as reference (see Appendix A).

[4] Icelandic Transportation Safety Board

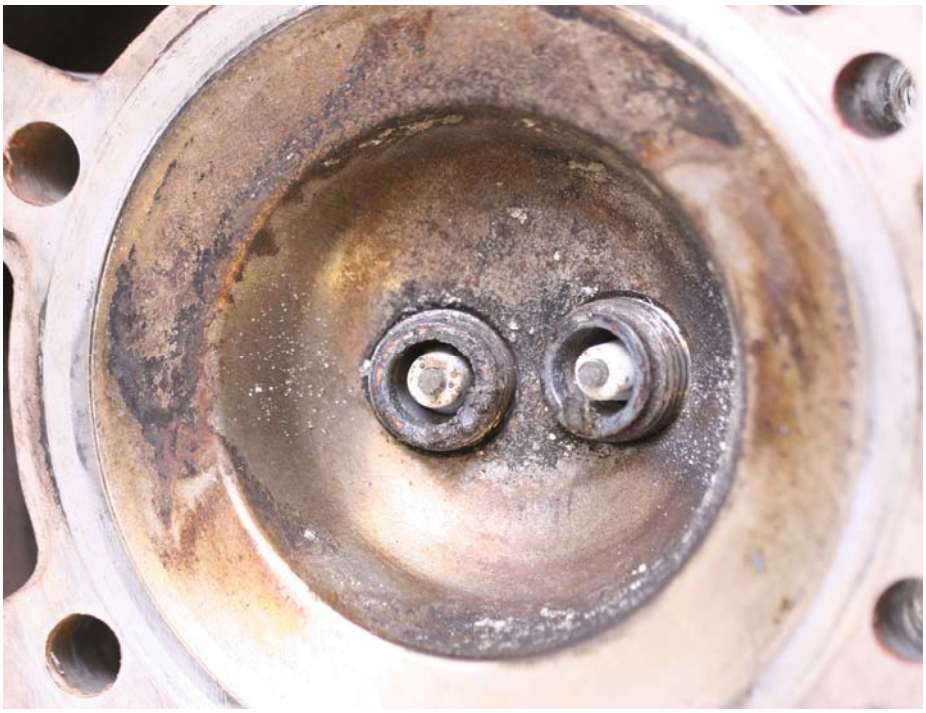


Figure 2: Rear head with the spark plugs installed

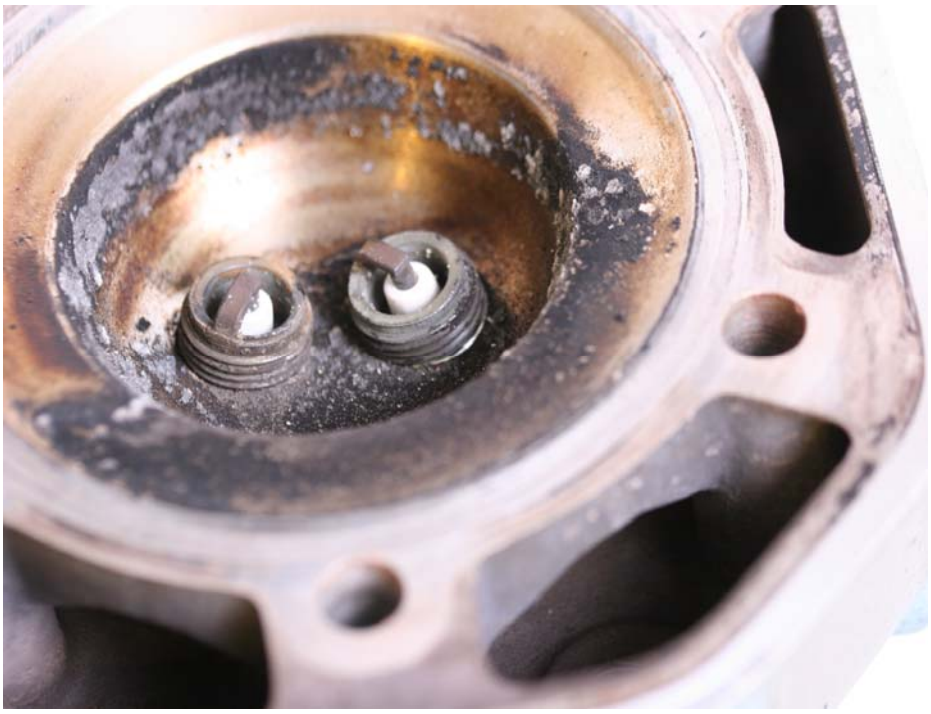


Figure 3: Forward head with the spark plugs installed

The investigation revealed that “NGK BR 8 ES” spark plugs were too long and not allowed per Hirth Engine 3502/3503 Spare-parts list (See Appendix B). Figure 4 shows one of the “NGK BR 8 **E**S” spark plugs that was installed prior to the accident on the LH side. It also shows on the RH side one of the “NGK BR 8 **H**S” spark plugs that was removed as part of that spark plug replacement.

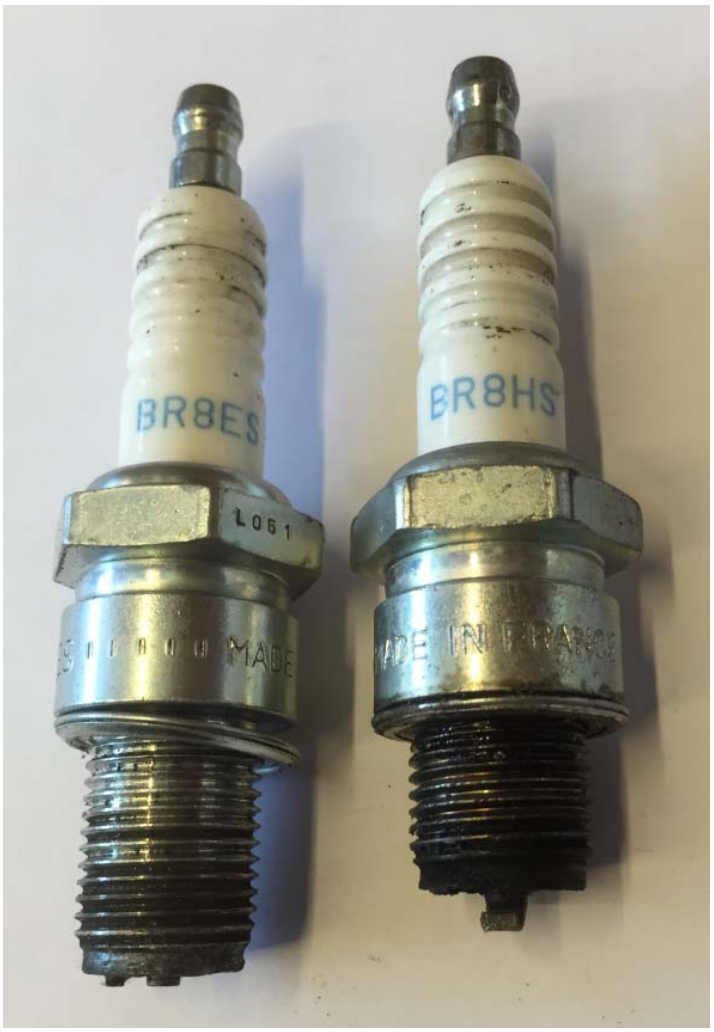


Figure 4: Installed BR 8 ES spark plug on LH side / Removed BR 8 HS spark plug on RH side

The investigation revealed that the NGK BR 8 ES spark plugs that were installed prior to the accident were also not allowed per the Hirth-Information 0046/1N spark plug list for the Hirth 3503 engine (see Appendix C).

The ITSB concluded that there was mismatch between the manufacturer‘s documents on what types of spark plugs to use in the Hirth 3503 engine.

Interestingly the removed NGK BR 8 **H**S spark plugs were also not allowed for the Hirth 3503 engine according to all three manufacturer’s references found in Appendix A – Appendix C.

The ITSB concludes that the cause of the accident was that the spark plug replacement was conducted using incorrect information in the engine‘s Operator‘s Manual.

2. SAFETY RECOMMENDATIONS

The ITSB makes the following safety recommendation:

M-03114 T01

> That Göbler Hirthmotoren KG updates its Operator‘s Manual for Hirth engine 3503 with the correct spark plug information in Table 4.1 of Chapter 6. Specifications – 3503 engine.

The following board members approved the report:

- Geirþrúður Alfreðsdóttir, chairman
- Bryndís Lára Torfadóttir, board member
- Gestur Gunnarsson, board member
- Tómas Davíð Þorsteinsson, deputy board member

On behalf *of the Icelandic Transportation Safety Board*

Ragnar Guðmundsson

Investigator-In-Charge

Reykjavik, 10. August 2017

APPENDIX A

Göbler-Hirthmotoren KG

Operator's Manual

Engine

3503

Göbler Hirthmotoren KG
Max-Eyth-Str. 10
71726 Benningen

Deutschland
Tel.: 07144/8551-0; Fax: 07144/5415

Germany
Phone:0049-7144-8551-0; Fax: 0049-7144-5415

e-mail: info@hirth-engines.de, **Internet:** www.hirth-engines.de

Operator's Manual

Engine

Model 3503

Read this operator's manual thoroughly before putting the engine into operation for the first time and comply strictly with the instructions given here.

In the interests of continual development of our engines we must reserve the right to change conditions of delivery for design, engineering and fixtures. We also request your understanding that no claims can be made against statements and Figures from this manual.

THIS ENGINE DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT. THIS ENGINE CAN BE USED IN EXPERIMENTAL AND ULTRA-LIGHT UNCERTIFIED AIRCRAFT ONLY IN CIRCUMSTANCES WHICH AN ENGINE FAILURE WILL NOT COMPROMISE SAFETY. BEFORE OPERATING THE ENGINE READ OPERATOR'S MANUAL INFORMATION AVAILABLE FROM YOUR AUTHORISED HIRTH DISTRIBUTOR.

6. Specifications – 3503 engine

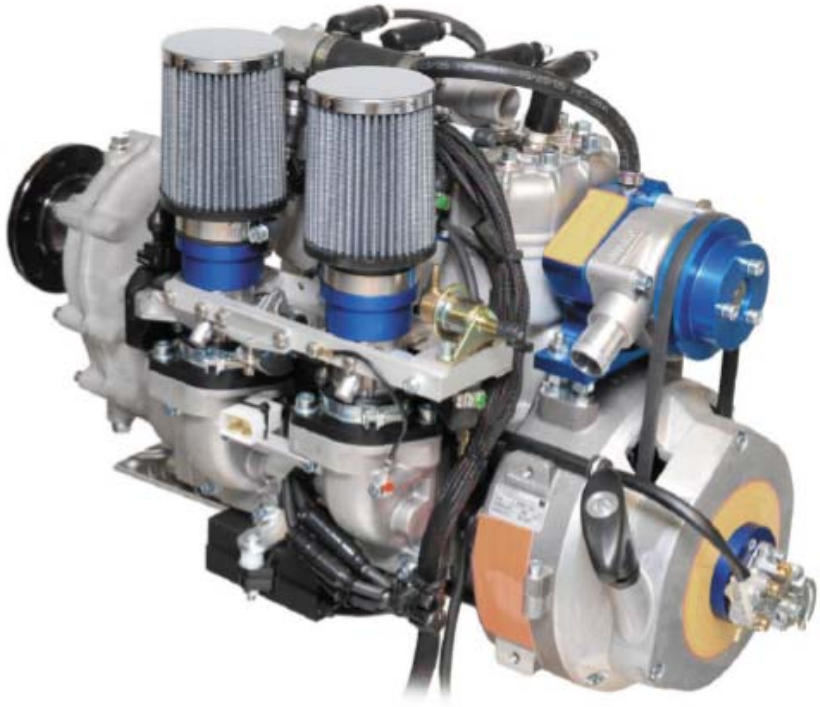
Table 4 .1

Manufacturer	Göbler-Hirthmotoren KG
Model	3503
Operating mode	Two stroke
Number of cylinders	Two in line
Piston Capacity	625 cm^3 (38.1 cu in)
Stroke Length	69 mm (2.72 in)
Bore	76mm (2.99 in)
Compression ratio	9.5:1
Performance	51.5 kW (70 HP) @ 6,500 rpm.
RPM, max.	6500 rpm
Direction of revs	Left, looking towards the drive shaft
Starter	Electric Starter and/or Recoil Starter
Ignition System	PVL CDI system, single or dual
Generator	250 W, 12 V
Sparkplugs	BR 8 ES (NGK) WR 4 CC (Bosch), W 24 ERS (ND)
Ignition Timing	18° v. OT (at 2000 rpm)
Carburation	2 DELLORTO PHBE 34 BD 6832, 2 Air filters
Cooling	Liquid cooling
Mixing	1:50
Fuel	Premium unleaded, 95 Octane
Two Stroke oil	Branded two stroke oil for hot (air-cooled) engines
Cylinder head temperature Max	
Exhaust gas temperature max	680^0 C / 1256^0 F
Fuel pressure min.	0.3 bar / 5.8 psi
Engine weight with exhaust System	36kg / 79lbs

APPENDIX B

HIRTH

Ersatzteilliste
Spare-parts list



Motor
Engine

3502/3503

Im Interesse der ständigen Weiterentwicklung unserer Produkte müssen wir uns Änderungen des Lieferumfanges in Form, Technik und Ausstattung vorbehalten. Wir bitten auch um Verständnis, dass aus Angaben dieser Ersatzteilliste keine Ansprüche abgeleitet werden können.

In the interest of the ongoing developments of our products, we reserve the right to change the delivery volume in form, technique and supply. We also ask for your understanding that the data in this instruction manual gives no further claims.

Version 1.03 vom 27.04.2011

Göbler-Hirthmotoren KG • Max-Eyth-Strasse 10 • D-71726 Benningen
Telefon 07144-8551-0 • Telefax 07144-5415 • info@hirth-engines.de • www.hirth-engines.de
Hotline 07144-8551-35; Dienstag von 8-12 Uhr und Donnerstag von 13-17 Uhr
Hotline 07144-8551-35; Tuesday 8-12 a.m. and Thursday 1-5 p.m.

Position Fig.No.	Stückzahl Quantity	Benennung Designation	Bestell-Nr. Part.No.	Bemerkung Remark note
470	1	Kennzeichnungsklemme „1" Mark binding screw „1"	026.43/1	
480	1	Kennzeichnungsklemme „2" Mark binding screw „2"	026.43/2	
490	1	Kennzeichnungsklemme „3" Mark binding screw „3"	026.43/3	
500	1	Kennzeichnungsklemme „4" Mark binding screw „4"	026.43/4	
510	4	Zündkerze Spark plug	023.29	
520	4	Kerzenstecker Spark plug connector	024.22	
530	1	Schlauchschelle Hose clamp	063.24	Kabel von Ankerplatte an 327 EA3 Wire from armature plate to 327 EA3
540	1	Haltewinkel f. 4fachstecker Holding square	S 1191/409U	
550	1	Kabelbinder Cable clip	026.40	
560	2	E-Box E-box	021.43/6	
570	1	E-Box-Halter Holder for e-box	S 1191/417	
580	8	Scheibe Washer	DIN 125 B6,4	
590	2	Sechskantschraube Hexagon head screw	DIN 931 M6x50	
600	2	Distanzhülse Distance sleeve	025.24	
610	2	Sechskantmutter Hexagon head nut	DIN 985 M6	
620	1	Befestigungswinkel Clamping square	S 1191/404	E-Box hinten an Zylinder E-box behind on cylinder

APPENDIX C

HIRTH

Hirth-Information

Mitteilung-Nummer: **0046/1N**

Inhalt: **Survey of spark plugs**

Datum: 28.01.2005

The tabulation as mentioned below quotes the respective types of spark plugs from different manufacturers which are suitable for Hirth engines.
If spark plugs from other manufacturers are used it is possible to find them out by using the conversion tables available from the manufacturers.

Engine	F 23	F 23 dual ignition	2702	2703	2703 dual ignition
Beru	14Z-3AU	14Z-3AU	14Z-3AU	14Z-3AU	14Z-3CU
Bosch	W 3 AC	W 3 AC	W 3 AC	W 3 AC	W 3 CC
Champion	L 78 C	L 78 C	L 78 C	L 78 C	N 3 C
Hirth	023.26	023.29	023.26	023.26	023.24
Power plug	023.32	023.32	023.32	023.32	023.33
NGK	BR 8 HS	B 8 HS	BR 8 HS	BR 8 HS	BR 8 ES
Nippon Denso	W 24 FSR-U	W 24 FSR-U	W 24 FSR-U	W 24 FSR-U	W 24 ESR-U

Engine	2704	2704 dual ignition	2706	2706 dual ignition	
Beru	14Z-3AU	-	14Z-3AU	-	
Bosch	W 3 AC	-	W 3 AC	-	
Champion	L 78 C	-	L 78 C	-	
Hirth	023.29	023.28	023.29	023.28	
Power plug	023.32	023.35	023.32	023.35	
NGK	BR 8 HS	CR 8 HSA	BR 8 HS	CR 8 HSA	
Nippon Denso	W 24 FSR-U	U 24 FSR-U	W 24 FSR-U	U 24 FSR-U	

Engine	F 30	F 30 dual ignition	F33	F 33 dual ignition	
Beru	14Z-3AU	-	14Z-3AU	-	
Bosch	W 3 AC	-	W 3 AC	-	
Champion	L 78 C	-	L 78 C	-	
Hirth	023.22	023.26	023.22	023.26	
Power plug	023.32	023.35	023.32	023.35	
NGK	B 8 HS	C 8 HSA	B 8 HS	C 8 HSA	
Nippon Denso	W 24 FS-U	U 24 FS-U	W 24 FS-U	U 24 FS-U	

Motor	3202	3202 dual ignition	3203	3203 dual ignition	
Beru	14Z-3AU	-	14Z-3AU	-	
Bosch	W 3 AC	-	W 3 AC	-	
Champion	L 78 C	-	L 78 C	-	
Hirth	023.29	023.28	023.29	023.28	
Power plug	023.32	023.35	023.32	023.35	
NGK	BR 8 HS	CR 8 HSA	BR 8 HS	CR 8 HSA	
Nippon Denso	W 24 FSR-U	U 24 FSR-U	W 24 FSR-U	U 24 FSR-U	

Motor	3503	3503 dual ignition	3701	3701 dual ignition	
Beru	-	-	-	-	
Bosch	-	-	-	-	
Champion	-	-	-	-	
Hirth	023.29	023.29	023.29	023.29	
Power plug	023.32	023.32	023.32	023.32	
NGK	-	-	-	-	
Nippon Denso	-	-	-	-	

- For PVL-ignition-systems use only spark plugs and spark plug connectors with 5 kOhm compensating resistance
- Spark plug gap generally 0,8 mm, exception engine F30 (spark plug gap 0,5-0,6mm)
- Never remove the compression ring of the spark plug, even not if you use a cylinder head temperature probe
- Spark plugs generally seize up only with torque wrench, the following torque values are guilty:

  M10 10-11 Nm 7,2-8 lbs.-ft.
  M14 24 Nm 17,5 lbs.-ft.

- Spark plug thread must be mounted with high-temperature paste (copper-paste)
- SAE-junction must be mounted with nut-lock expedient
- Never clean spark plugs with brush or hard subjects

Note: The use of spark plugs not coming from Göbler Hirthmotoren will lead to lapse of any claim for warranty.
If there are any questions in relation to this or other items concerning Göbler Hirthmotoren please do not hesitate to contact us accordingly.

Phone international: 0049 7144 / 6074
Fax international: 0049 7144 / 5415