

## APPENDIX A

### RESPONSES TO THE DRAFT REPORT: 'ENGINE FAILURE FOLLOWED BY EMERGENCY LANDING, DIAMOND DA 50 RG, KEMPEN AIRPORT'

Reading guide: The fourth and fifth column show the literal responses of the review parties. The last column contains an explanation from the Dutch Safety Board on the way in which the responses of the parties are processed.

No.	Organisation	Section	Text to be corrected (first ... last word)	Argumentation for response	Adopted?	Dutch Safety Board's response
1	Pilot	Factual information	700 feet above ground >>> 300 feet above ground	correct value conform ADS-B data	Yes	Comment adopted; the value has been corrected to conform with ADS-B data.
2	Pilot	Factual information	about 800 feet >>> about 500 feet	correct value conform ADS-B data	Yes	Comment adopted; the value has been corrected to conform with ADS-B data.
3	CAA NL	Engine teardown	Despite metal chips in the camshaft housing, all camshafts and their bearings were in sufficient lubricated, no signs of wear or overheat.	Text correction: "insufficient" instead of "in sufficient"	Yes	Comment adopted; text corrected accordingly.
4	CAA NL	Factual information	During the ... Loss scenarios	CAA NL agrees that within the letter of the law partial engine failure scenarios are not mentioned in the EU Part-FCL training syllabus for e.g. a licence or a class rating. These scenarios might therefore not be trained (properly). Nevertheless, CAA NL would like to nuance that within the spirit of the law these scenarios will be addressed during the practical training within the scope of airmanship and threat and error management (proper decision making), since it is not possible to train all possible scenarios that could happen in the future. This is demonstrated by the pilot of the OO-HAN, who made the proper decision to stay within the circuit area and close and within gliding distance to the runway. Nevertheless, CAA NL agrees that it is recommended that during the training syllabus mentioned before, it is recommended to pay additional attention to partial (or possible developing) engine failure scenarios.	No	The report acknowledges that partial engine failures are not explicitly required within the EU Part-FCL syllabus, but may be addressed under broader airmanship and threat and error management principles. However, as highlighted in this report, the complexity of decision-making in such scenarios suggests that additional attention to partial engine failures within training could enhance pilot preparedness.
5	CAA NL	Analysis	The decision ... Complete failure. / Partial engine ... Standardized training	As mentioned above	No	See comment above.
6	CAA NL	Conclusion	This occurrence ... similar circumstances	As mentioned above	No	See comment above.
7	CAA NL	Analysis	The decision ... Complete failure. / Partial engine ... Standardized training	Taking the decision to land in a nearby field too lightly in the event of a partial engine failure could potentially lead to more incidents and accidents. However, adequate training and pilot awareness appear to be a more appropriate means of addressing such issues.	Partially	The Dutch Safety Board agrees that the decision to land in a field nearby should not be taken too lightly. This section emphasises the challenges presented by partial engine failures and the value of training such scenarios. Furthermore, specifically for this occurrence, it has been included that the Loozerheide, as it is a densely forested area, is unsuitable for an emergency landing.
8	Diamond	Aircraft Information	constructed -> produced	The word "constructed" is more commonly associated with the meaning of "developed". We suggest to use the word "produced".	Yes	Comment adopted; 'constructed' has been replaced with 'produced' for improved clarity.
9	Diamond	Summary of manufacture's investigation	The engine ... potential connection.	If possible the status of the investigation, at the time the report is closed, should be clarified. In case something is still open that has no effect on the investigation report, it should be clearly stated or this sentence should be removed.	Yes	Amended the text accordingly to clarify the status of the investigation at the time of report finalisation. The engine manufacturer has concluded the investigation into the OO-HAN engine.

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10	BFU	Cover page	Bearing Failure	Bearing Failure is very specific. It is not clear which bearing is meant. In fact, it was an engine failure with an emergency landing.	Yes	Comment adopted; the title has been revised for clarity and accuracy.
11	BFU	Summary	However, residues of casting sand found within the engine's oil gallery	See comment from Continental. Proposed wording: casting sand was found firmly embedded in the casting.	Yes	Comment adopted; 'embedded' has been added for improved clarity.
12	BFU	Summary	The pilot's decision to remain .....	It is good airmanship to be prepared for a total loss of power after an engine problem. Sections 03-17 and 03-18 and 03-20 of the DA-50 Flight Manual describe several situations in which no complete loss of power occurs. Proposed wording: Even if partial engine power loss is not explicitly covered under the Dutch licensing syllabus, the pilot should be prepared for a total power loss and the subsequent emergency landing.	Partially	Comment partially adopted; the text has been revised to acknowledge pilot preparedness expectations and the DA50 Flight Manual, while maintaining the report's focus on the challenges of responding to initial signs of engine performance degradation.
13	BFU	Factual information	<i>should be added</i>	It should be added whether the pilot performed a before take-off briefing. This is not required but part of the single pilot CRM.	Yes	Comment adopted; the text has been revised to include that the pilot conducted preflight preparations, including a review of the engine failure procedure during takeoff.
14	BFU	Factual information	This total power loss forced him to attempt a glide towards Runway 03.	The continuation of the left turn after the total power loss shows that the pilot intends to approach the threshold of runway 03.	No	Comment not adopted. This statement is incorrect. The pilot intended to align with Runway 03 but not to specifically approach the threshold.
15	BFU	Factual information	<i>should be added</i>	As the pilot's performance is an important factor, the age should also be reported.	Yes	Comment adopted; the pilot's age has been added to the text.
16	BFU	Factual information	<i>should be added</i>	The report intensively addresses the lack of training of partial engine power loss, in licensing syllabus. However, it is not stated whether the pilot did not or possibly had such training.	Yes	Comment adopted; the text has been revised in Section 3.2 - Training Partial Engine Failure to clarify that the pilot had not received specific training on partial engine power loss.
17	BFU	Factual information	<i>should be added</i>	Based on the ADS data, a description of the vertical flight profile would be highly desirable.	Yes	Comment adopted; a graph depicting the vertical flight profile based on ADS-B data has been added to the report.
18	BFU	Factual information	<i>should be added</i>	and (SUB) Austria and Diamond Aircraft.	Yes	Comment adopted; the text has been revised to include the presence of the Austrian investigation authority and Diamond Aircraft at the teardown inspection.
19	BFU	Factual information	<i>should be added</i>	The results of the oil sample should be mentioned. In this conjunction the content of silicium should be assessed.	Yes	Comment adopted; the oil sample results have now been received and included in Appendix F. The analysis indicated elevated levels of copper and silicium, confirming the presence of casting sand residues. This finding supports the investigation's identification of embedded casting sand as a potential contributing factor to the bearing failure.
20	BFU	Factual information	Small amounts of casting sand were discovered in the oil gallery.	According to Continental's information, this is only partially correct. The current statement could give the impression that the sand flowed through the oil gallery. Proposed wording: the casting sand was found firmly embedded in the casting.	Yes	Comment adopted; the text has been revised to clarify that the casting sand was found firmly embedded in the casting, preventing any misinterpretation regarding its movement through the oil gallery.
21	BFU	Factual information	Only minor contamination was found in the oil galleries of the five engines examined, and no evidence of the same failure mode as OO-HAN was observed	These engines had no damage, although embedded residues of casting sand were also found on them, similar to engine 06-01-00056.	Yes	Comment adopted; the text has been revised to clarify that the casting sand was found firmly embedded in the casting, preventing any misinterpretation regarding its movement through the oil gallery.

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22	BFU	Factual information	<i>should be added</i>	See comment 13	Yes	Comment adopted; the text in Section 2.1 has been revised to include that the pilot conducted preflight preparations, including a review of the engine failure procedure during takeoff.
23	BFU	Analysis	However, during the critical phase of the approach, while executing a turn towards the runway, the aircraft's low airspeed and higher bank angle used in the turn resulted in a high rate of descent.	BFU is of the opinion that the flight path was not optimised for an emergency landing leading to low airspeed and unnecessary high bank angle. Based on the limited information available, it seems reasonable that a safe landing was possible even after the total power loss at that altitude. This indicates that the pilot's decision about the flight path is a causal factor in this accident. Proposed wording: However, during the critical phase of the approach, while executing a turn towards the threshold of runway 03, but not to a safe landing area, the aircraft's low airspeed and higher bank angle used in the right turn resulted in a high rate of descent. Therefore, the pilot was unable to perform a controlled landing.	Partially	Comment partially adopted; the text has been revised to clarify that the aircraft's low airspeed and high bank angle led to a high rate of descent, preventing a controlled landing, without speculating on alternative outcomes. The pilot intended to align with Runway 03 but not to specifically approach the threshold.
24	BFU	Analysis	The engine manufacturer's investigation identified residues of casting sand within the oil gallery, a potential contributing factor to the lubrication failure of main bearing #2.	This sentence contradicts the statement that the cause of the bearing damage has not been found. The existence of embedded sand on the casting does not lead necessarily to sand in the oil gallery. The results of the oil sample and the investigation of the other 5 engines should be considered in the analysis. Proposed wording: The engine manufacturer's investigation identified residues of casting sand within the oil gallery, a probable contributing factor to the lubrication failure of main bearing #2.	Partially	Comment partially adopted; the text has been revised to clarify that while casting sand was identified near the oil gallery, no definitive causal link to the bearing failure was established. The findings from the oil sample and investigation of the other five engines have been considered in the analysis.
25	BFU	Analysis	Inspections of other engines in the field did not reveal similar contamination.	This sentence contradicts the statement on page 19, line 4-5.	Yes	Comment adopted; the text has been revised to resolve the contradiction.
26	BFU	Analysis	However, during alignment with the runway .....	The need for an alignment with the runway with a higher-than-normal bank angle is a consequence of the chosen flight path. See comment 23.	Partially	Comment partially adopted; the text has been revised to acknowledge that the flight path led to the high-bank-angle turn, while maintaining a factual description of events.
27	Continental	first side	Bearing Failure	In Flight Shut Down	Yes	Comment adopted in line with comment number 10; the title has been revised for clarity and accuracy.
28	Continental	Summary	residues of casting sand found	the casting sand was found firmly embedded in the casting	Yes	Comment adopted; 'embedded' has been added for improved clarity.
29	Continental	Summary	not written currently	an oil filter and oil filler cap was also missing; Without an oil filter, the engine oil cannot be effectively cleaned of impurities such as dust, dirt particles, abrasion and other foreign bodies. These particles circulate unhindered through the engine and can damage the internal components.	No	Comment not adopted; while the oil filter and oil cap were missing during the post-crash examination, there is no evidence that either was absent before takeoff or that they contributed to the engine failure. The oil filter, which contained combustible filter media, was likely consumed in the post-impact fire. Additionally, if the oil cap had been missing before departure, abnormal oil pressure fluctuations would likely have been recorded in the FADEC data, but no such anomalies were observed before the failure. Additionally, no impurities have been found other than casting sand.
30	Continental	Summary		oil filler cap was not found during investigation on scene that could lead into a oil loss	No	See comment above.
31	Continental	Factual Information	This engine is geared, liquid-cooled	The propeller is driven via an integrated reduction gearbox (i=1.667) with dual mass flywheel	Yes	Comment adopted; the text has been revised to specify that the propeller is driven via an integrated reduction gearbox with a dual mass flywheel.

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32	Continental	Factual Information	The owner did not detect any anomalies in the interim. Therefore, no scheduled or unscheduled maintenance had been performed on the aircraft since the aircraft was delivered from the factory in October 2022.	06-OM-06-01 there was a 3-6hrs maintenance; Exchange of Engine Oil and Filter, this needs to be explained if this was done or not.	Yes	The 3-6 hours maintenance check, as outlined in OM-06-01 at the time of production of OO-HAN (October 2022), did not yet mandate the replacement of the engine oil filter. The requirement to replace the oil filter was introduced in OM-06-01, issue 2, revision 5, on 19 October 2023 - after the aircraft was built. According to the production organization, the engine oil filter was therefore not replaced during the 3-6 hours maintenance check for OO-HAN.
33	Continental	Factual Information	The engine oil filter and its bowl were missing, as the filter bowl had torn off (see Figure 6). Additionally, the oil filler cap was missing (see 20 Figure 7).	these parts could not be found during several attempts of search	Yes	Comment adopted; the text has been revised to clarify that the oil filter, filter bowl, and oil filler cap could not be found despite multiple search attempts
34	Continental	Factual Information	Main crankshaft bearings	The CD300 has 4 main bearings	Yes	Comment adopted; the text has been corrected to reflect that the CD-300 engine has four main bearings.
35	Continental	Factual Information	Oil nozzles:	The CD300 has 3 oil nozzles while one is lubricating two pistons.	Yes	Comment adopted; the text has been revised to clarify that the CD-300 has three oil nozzles, with each nozzle lubricating two pistons.
36	Continental	Factual Information	Main bearing B #2: Lubricates big-end bearings #1 and #4. Main bearing B #3: Lubricates big-end bearings #2 and #5. Main bearing B #4: Lubricates big-end bearings #3 and #6.	Main bearing B #1: Lubricates big-end bearing #1 Main bearing B #2: Lubricates big-end bearings #2 and #4. Main bearing B #3: Lubricates big-end bearings #3 and #5. Main bearing B #4: Lubricates big-end bearing #6.	Yes	Comment adopted; the numbering of the main and big-end bearings has been corrected accordingly.
37	Continental	Factual Information	bearings #1 and #4	bearings #2 and #4	Yes	Comment adopted; the numbering of the main and big-end bearings has been corrected accordingly.
38	Continental	Factual Information	rod bearings #1 and #4	rod bearings #2 and #4	Yes	Comment adopted; the numbering of the main and big-end bearings has been corrected accordingly.
39	Continental	Factual Information	Small amounts of casting sand were discovered in the oil gallery.	the casting sand was found firmly embedded in the casting	Yes	Comment adopted; 'embedded' has been added for improved clarity.
40	Continental	Factual Information	Small amounts of casting sand were discovered in the oil gallery. These residues, originating from the casting process, may have interfered with the oil flow, preventing the formation of a consistent oil film at bearing #2. The engine manufacturer continues to examine this potential connection.	the casting sand was found firmly embedded in the casting. Despite of that there was also a missing oil filler cap as well as a missing oil filter. Without an oil filter, the engine oil cannot be effectively cleaned of impurities such as dust, dirt particles, abrasion and other foreign bodies. These particles circulate unhindered through the engine and can damage the internal components.	No	Comment not adopted; while the oil filter and oil filler cap were missing during the post-crash examination, there is no evidence that either was absent before takeoff or that they contributed to the engine failure. The engine failure was traced to the destruction of main bearing #2, with casting sand residues embedded in the oil gallery identified as a potential contributing factor. FADEC data did not indicate any anomalies before takeoff that would suggest oil contamination due to a missing filter or oil cap.
41	Continental	Factual Information	Only minor contamination was found in the oil galleries of the five engines examined, and no evidence of the same failure mode as OO-HAN was observed	it has to be noted in four of the five engine casting sand embedded residues found similar as in Engine 06-01-0056 / OOHAN	Yes	Comment adopted; the text has been revised to clarify that embedded casting sand residues were found in four of the five examined engines, similar to those in Engine 06-01-0056 / OO-HAN.
42	Continental	Analysis	cylinders #1 and #4 via	cylinders #2 and #4 via	Yes	Comment adopted; the numbering of the cylinders has been corrected accordingly.

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43	Continental	Analysis	subsequent engine teardown confirmed that:	missing oil filler cap as well as a missing oil filter	No	Comment not adopted; while the oil filler cap and oil filter were missing during the post-crash examination, but there is no evidence that they were absent before takeoff or that they contributed to the engine failure. The analysis section focuses on confirmed causal factors.
44	Continental	Analysis	investigation identified residues of casting sand	investigation identified embedded residues of casting sand	Yes	Comment adopted; 'embedded' has been added for improved clarity.
45	Continental	Analysis		A missing oil filter in the engine can lead to significant problems and damage, as the oil filter plays a crucial role in maintaining engine function and service life. Here are the main consequences: 1. increased engine oil contamination. Without an oil filter, the engine oil cannot be effectively cleaned of impurities such as dust, dirt particles, abrasion and other foreign bodies. These particles circulate unhindered through the engine and can damage the internal components.	No	Comment not adopted; while the oil filter was missing during the post-crash examination, but there is no evidence that it was absent before takeoff or that it contributed to the engine failure. The analysis section focuses on confirmed causal factors. Additionally, no impurities have been found other than casting sand.
46	Continental	Analysis	including big-end bearings #1 and #4.	including big-end bearings #2 and #4.	Yes	Comment adopted; the numbering of the cylinders has been corrected accordingly.
47	Continental	Analysis	It was, however potentially exacerbated by contamination from casting sand within the oil gallery.	It was, however potentially exacerbated by contamination from casting sand within the oil gallery or missing oil filter leading into a status while the engine oil cannot be effectively cleaned of impurities such as dust, dirt particles, abrasion and other foreign bodies. These particles circulate unhindered through the engine and can damage the internal components.	Partially	Comment partially adopted; the text has been revised to acknowledge the role of oil contamination in general, but it does not assume that the oil filter was missing before takeoff or that oil impurities contributed to this failure. See also comment number 40.
48	Continental	Conclusion	residues of casting sand within	residues of embedded casting sand within.	Yes	Comment adopted; 'embedded' has been added for improved clarity.
49	Continental	Conclusion		The manufacturer also states that a missing oil filler cap can lead to oil loss. Furthermore, a missing oil filter can lead to contamination such as dust, dirt particles, abrasion and other foreign bodies. These particles circulate unhindered through the engine and damage the internal components.	No	Comment not adopted; the conclusion focuses on confirmed causes and contributing factors. While the manufacturer states that a missing oil filler cap or oil filter could lead to oil loss or contamination, there is no evidence that either was absent before takeoff or that they played a role in this engine failure. See also comment number 40.