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Title	Rotorcraft gearbox loss of lubrication
NPA Number	NPA 2017-07

Aerossurance (andy.evans@aerossurance.com) has placed **22** unique comments on this NPA:

Cmt	Segment description	Page	Comment	Attachments
102	(General Comments)	0	We are supportive of the NPA and the safety benefit it will bring.	
11	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.917	8	CS29.917: We note the prior discussion about explicitly including the lubrication system in the definition. We would be surprised if it was not seen to be part of the RDS by all competent applicants as otherwise it would be 'equipment' under Sub-Part F, however we agree that clarity is beneficial. While the focus of this NPA is on lubrication we feel it would be worth ensuring the definition encompasses all parts necessary for the function of power transmission in normal an emergency circumstances (while avoiding extending the definition into non-RDS structure that supports the RDS or cockpit instrumentation inappropriately). Therefore we propose replacing 'transmit power' with 'enable the continued transmission of power' in the proposed text.	
12	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.917	8	CS29.917: To avoid any 'creative misinterpretations' we suggest adding at the end: "or are necessary for the continued transmission of power".	
100	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.927	8 - 9	29.1521(k): The proposed text is "For gearboxes which utilise a pressurised lubrication system..." whereas 29.927(c) states "For lubrication systems required for proper operation of rotor drive systems". Recommend aligning both. Suggest using as a basis "Each gearbox lubricated by a pressurised system that is essential for continued safe flight and safe landing should be tested."	
15	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.1521	9	29.1521(k): delete "red" as CS 29.1322 specifies that warnings should be red and defines the warning, caution and advisory light philosophy (or reference 29.1322).	
99	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.1521	9	29.1521(k): The proposed text is "For gearboxes which utilise a pressurised lubrication system....." whereas 29.927(c) states "For lubrication systems required for proper operation of rotor drive systems". Recommend aligning both. Suggest using as a basis "Each gearbox lubricated by a pressurised system that is essential for continued safe flight and safe landing should be tested."	

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101	3.1.2. Draft resulting text: CS-29 - BOOK 1 - CS 29.1521	9	29.1521(k): RFM instructions need to be worded such they discourage a crew from deciding to remain airborne flight (for example to reduce the time until a SAR asset is on-station) and increasing the risk of a catastrophic in-flight failure. We suggest adding to 1521(k) or creating AMC for 1521 to emphasise that 29.927(a)(5) states; "This AMC provides guidance for completion of the loss of lubrication test and on how to demonstrate confidence in the margin of safety associated with the maximum period of operation following loss of lubrication, as defined in the RFM emergency procedures. This margin of safety is intended to substantiate a period of operation that has been evaluated as likely to be safer than making a forced landing over hostile terrain." And "Accordingly, this does not constitute a safe period of operation, but a period that has been evaluated as likely to be safer than making a forced landing over hostile terrain."	
16	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.917	10	AMC 29.917(a): To ensure appropriate consideration of maintenance human factors and human centred design recommend adding to sentence 1: "...including any foreseeable errors made during assembly or maintenance that cannot be readily detected during specified functional checks".	
19	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.917	10	AMC 29.917 contains defined terms that are only defined in AMC29.927(c). There needs to be a clear linkage. We suggest moving those definitions of terms used first in AMC 29.917 from AMC 29.927(c) to AMC 29.917 and adding a reference in AMC 29.927(c) that this list supplements terms defined in AMC 29.917. Alternatively simply add a note in AMC 29.917 that definitions can be found in AMC 29.927(c).	
13	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(a)(4): To avoid any 'creative misinterpretations' that for example a loss of containment of oil from outside an oil cooler, pump or oil line (e.g. from the casing or component attached to the lubrication system) is not a lubrication system failure, we suggest adding to the list: casings, shaft seals, oil debris monitoring devices, sensor or access ports	
14	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(c): To avoid any 'creative misinterpretations' that for example a loss of containment of oil from outside an oil cooler, pump or oil line (e.g. from the casing) is not a lubrication system failure, we suggest adding a definition "Lubrication System Failure: Any failure that prevents or degrades the lubrication system performance".	
17	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(a)(4): Typo: "eventlually" should be "eventually"	
18	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	29.927(b)(2): Typo: extra space before full stop.	
20	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(c) Definition of Residual oil: For total clarity suggest adding a comment that: depending on the failure mode, the Residual Oil may decrease due to continued oil loss.	

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21	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(c)(7) Add to the list "fittings" and "oil coolers" and reconsider the use of the word 'Typically'.	
22	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC29.927(e)(2) Typo: "provisions for" should be "provisions for"	
23	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC29.927(f)(1): Suggest adding a new third sentence: Conceivably slow initial oil loss and late warning may cause more damage than a rapid oil loss and early warning.	
24	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC29.927(h)(2): Suggest adding a requirement to assess and minimise foreseeable error in assembly and maintenance.	
25	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC29.927(i)(12): Suggest adding (iv): Noise and/or vibration detected by the crew should not be considered a reliable secondary indication on their own.	
96	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(i): Where a design uses super-finished bearings and gear teeth, or other degradable features these may affect a test result. Similarly different combinations of components at extremes of build tolerance may also have an effect. It would be therefore prudent to add a requirement that: Foreseeable wear and degradation of components or extreme combinations of component tolerances should be considered to determine if a difference in performance is possible between the tested configuration and an in-service gearbox, with an appropriate reduction of the maximum period of operation being made, if necessary.	
97	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(e): To avoid unrepresentative testing add: Where a gearbox design relies small quantities of residual oil in specific parts of the MGB after an oil loss, the test should be conducted with a minimum quantity of residual oil or less, in each critical area of the MGB. An assessment is made of the effect of flight conditions on the local retention of residual oil.	
98	3.1.2. Draft resulting text: CS-29 - BOOK 2 - AMC 29.927	10 - 21	AMC 29.927(e)(1)(iv): Is it realistic to assume that real life lubrication system failure won't also result in higher T/R torque, prior to reduction of power by the crew? For example when manoeuvring for landing / ditching.	