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1	*Airbus Helicopters*	§3.1	5	*"For external installations that are in the vicinity of the fuel tank that can be shown to be less critical than the structure and design features that were previously certificated and tested with the fuel tank at the time of TC (reference drop test), no additional drop test is required"* AH concurs, but what kind of demonstration is considered as acceptable by EASA to show that?	Example of acceptable justification means (to demonstrate the lower criticality level) would be interesting (engineering judgment, simple calculations, other).	Yes	No	Accepted	The revised CM clarifies this point.
2	*Airbus Helicopters*	§3.2.1	6	This section deals with dynamic drop test, without giving any details on the test specimen configuration. The door shall be let open to partial drop test when deemed appropriate by the applicant (to demonstrate correct behavior on a limited area for instance), instead of full drop test.	Give more details on the drop test specimen, and let the possibility to the applicant to propose partial drop tests, if judged sufficient to demonstrate correct local behavior (installation of relatively small component under the fuel tank)	Yes	No	Partially accepted	The revised CM simplifies the compliance demonstration approach for simple installations protected. However, without such protection partial or complete test specimen definition can be proposed on a case by case basis. It will be however design dependant.
3	*Airbus Helicopters*	§3.2.1	6	The figure lists only one drawback linked to the dynamic drop test. AH position is that two important drawbacks are missing : cost and lead-time	Add cost and lead time in in the "Cons" list.	Yes	No	Noted	Removed from the revised CM.
4	*Airbus Helicopters*	§3.2.2	6	AH agrees on the fact that prediction by simulation of behavior of very small structures, like composite needles, and their potential interaction with the fuel tank, is difficult. But AH also reminds that this is not the goal of dynamic simulation proposed several times on recent programs. The purpose of dynamic simulation is to demonstrate that there is no regression in the surrounding structure behavior after the modification compared to the drop tested one (the structure is not more aggressive to the fuel tanks after the change). AH position is that dynamic simulation is reliable to demonstrate absence of leakage as far as the following criteria are met : - Same kind of rupture mode(s) (Failure initiation and pattern) between simulation (post mod) and reference drop test - Stress and strain level within the bladder tank skin and junctions (with fuel plate for instance) are kept within the allowable ranges - There is no evidence of any new behavior that could induce detrimental consequence on fuel components (fuel plate, intercoms, fuel probe, junction with fuel pump, etc)	The memo may incorporate the criteria proposed by AH to demonstrate absence of leakage after the change : - Same kind of rupture mode(s) (failure initiation and pattern) between post modification simulation and reference configuration - Stress and strain level within the bladder tank skin and junctions (with fuel plate for instance) within the allowable ranges - There is no evidence of any new behavior that could induce detrimental consequence on fuel components (fuel plate, intercoms, fuel probe, junction with fuel pump, etc)	Yes	No	Noted	The revised CM does not address the drop test simulation. If further developments are judged necessary, it will be managed in an individual CM dedicated to the dynamic simulation.
5	*Bell Helicopter Textron*	General	/	The 27.952 Fuel System Crash Resistance Standard is intended to minimize the risk of post crash fire in the event of a survivable crash landing. With the introduction of the 27.562(b)(1) standard on "Emergency Landing Dynamic Conditions", the 95th percentile occupants are reasonably protected for a change in vertical velocity of 26 ft/sec (ref DoT/FAA/CT-85/11) whereas the 50 ft fuel drop test	Suggestion is to put the CM on hold and to establish a working group to give further consideration to the feasibility and cost/benefit of mandating compliance for structural items beyond the immediate fuel cell enclosure. In addition, direct the working group to develop new standard for airframe systems crashworthiness using	Suggestion	Yes	Noted	The revised CM has been elaborated based on the conclusion of the CRFS ARAC ROPWG aiming at the improvement of rotorcraft occupant safety and minimisation of PCF. The external installations were not specifically part of the study however the conclusion of the ARAC group has been used to support the CM revision.

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				prescribed by 27.952 results in 57 ft/s impact velocity. The fuel drop test of the cell with surrounding structure provides a reasonably economical and satisfactory test standard and is deliberately designed to be way in excess of a survivable crash. Aircraft Systems (such as the rotor/transmission, engine and internal cargo) are typically located in the vicinity of the fuel tanks. In many designs, they are located above the fuel tanks to help minimize the impact of centre of gravity variability related to fuel usage. Numerous aircrafts have been recently certified to the 27.952 requirement with aircraft systems in the vicinity of the fuel tanks. It should be noted that aircraft systems are designed in compliance with the Static Inertia load factor of 27.561(c)(4) to restrain large items of mass subject to a maximum 12G downward acceleration (original cert basis for older aircraft was 4g). If large items of mass were to be included in a 50 feet free fall, the restraints could potentially fail and they could become hazardous to the fuel tanks. However, the drop test does not mandate the inclusion of these hazardous items for the 50 ft drop and thus there is diminished benefit to the occupants by demonstrating only the lesser hazards of mass located below the fuel cell. Based on this observation, 27.952(a)(4) interpretation of the “Surrounding Structure” considers only the immediate surrounding structure for the fuel cell containment. The primary intent of the 50 feet drop test is to validate the fuel bladder and frangible coupling interactions with the surrounding enclosure to ensure that excessive deformation or failure/fracture of it will not lead to fuel leakage. A mandatory demonstration of compliance for relatively small structural features external to the basic cell enclosure is not commensurate with the greater potential hazards to the fuel cell. The 50 feet drop test significantly minimizes the risk of post crash fires in recent survivable crash landing when compared to “prior” 27.952 rotorcrafts. Similar to the Aircraft Systems, any external installation should be substantiated against the 27.601(a) “Design”, 527.561(c) “Crash” and 527.727(c) “Ground Clearance” standards. If those standards are not considered to provide a satisfactory level of safety for external installations in the vicinity of fuel tank, a new standard should be created to define a more holistic energy-based survivable crash description with harmonized design parameters accounting for all potential hazards. This could however create more complexity and cost in demonstrating compliance and	a more holistic energy-based survivable crash description with harmonized design parameters accounting for all potential hazards to the occupants.				

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				a cost/benefit analysis should be done to rationalize the introduction of such a standard. With specific reference to the certification memo, clearly, Option 1 is undesirable and economically not feasible to expect a demonstration of compliance by test for every permutation of kit installation in the vicinity of the tanks. Option 3 is not practical since many kit installations are ideally located under the rotor for the same reasons as locating the fuel tanks under the rotor; that is to minimize impact on the aircraft longitudinal cg. Installing protective features would create a weight and design space penalty. Option 2 is really the only option and will be limited to the applicants with the technical knowledge and dynamic structural properties for the fuel tank and surrounding structure. However, option 2 does require a 'fully instrumented' drop test specimen for correlation and is subject to the conditional acceptance for the characteristics and reliability of the baseline simulation. Furthermore, the reliability of the extrapolation for the dynamic simulation may be conditional to the structural configuration and drop orientation and may not conclusively demonstrate fuel containment and ultimately will be the subject of arbitrary acceptance. The overall cost and weight penalties and constraints on kit configurations may have a negative impact and encourage operators to continue operations with older designs and make the purchase of new designs with significantly improved crashworthiness (in a basic configuration) a much less desirable and postponed alternative.					
6	*Bell Helicopter Textron*	General	/	The current and more comprehensive crash resistant fuel system (CRFS) design and test criteria to the airworthiness standards for normal and transport category rotorcraft were introduced as part of FAR 27 AMDT 27-30 and FAR 29 AMDT 29-35 in order to minimize fuel spillage near ignition sources, minimize potential ignition sources and, therefore, improve the evacuation time needed for crew and passengers to escape a post-crash fire (PCF). Prior to the introduction, a thorough research was conducted including a survey of historical safety data to determine the necessity for CRFS standards. Rotorcraft accidents and incidents that resulted in a PCF were studied to define the statistical nature and magnitude of the hazards. The proposed standards (at that time) were further validated by military safety statistics and their adoption would significantly minimize the PCF hazard and its associated fatalities and injuries. Further, a benefit-cost comparison was	Suggestion is to put the CM on hold and to establish a working group to give further consideration to the feasibility and cost/benefit of mandating compliance for post cert structural items beyond the immediate fuel cell enclosure.	Suggestion	Yes	Noted	The Cert Memo does not introduce new requirements or modify existing ones, it rather provides guidance for compliance demonstration with current standards, without even constituting AMC or GM. The revised CM has been elaborated based on the conclusion of the CRFS ARAC ROPWG aiming at the improvement of rotorcraft occupant safety and minimisation of PCF. The external installations were not specifically part of the study however the conclusion of the ARAC group has been used to support the CM revision.

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				analyzed with positive outcome to validate the appropriateness of the standards in review. The EASA proposed CM, which mainly targets post TC modification for specific types of rotorcraft mission, is a departure from the acceptable approach used until today and this could become an additional burden for the applicant in term of development, production and operating cost. Today, only the fixed provision of any external installation in the vicinity of rotorcraft fuel tank is considered for the purpose of fuel system drop test article as the compliance means against FAR 27/29.952(a). This approach still remains acceptable for the other certification authorities. It is recommended that additional research data and benefit-cost analysis similar to the above stated but specifically focus on the types of rotorcraft mission requiring an externally mounted hardware under the fuel tank be reviewed and presented to validate the necessity for the proposed CM as part of the public review process. Reference: FAA Notice of Proposed Rulemaking. Notice No. 90-24; Issued on 09/27/90					
7	*GAMA*	General	/	The 27.952 Fuel System Crash Resistance Standard is intended to minimize the risk of post crash fire in the event of a survivable crash landing. With the introduction of the 27.562(b)(1) standard on "Emergency Landing Dynamic Conditions", the 95th percentile occupants are reasonably protected for a change in vertical velocity of 26 ft/sec (ref DoT/FAA/CT-85/11) whereas the 50 ft fuel drop test prescribed by 27.952 results in 57 ft/s impact velocity. The fuel drop test of the cell with surrounding structure provides a reasonably economical and satisfactory test standard and is deliberately designed to be way in excess of a survivable crash. Aircraft Systems (such as the rotor/transmission, engine and internal cargo) are typically located in the vicinity of the fuel tanks. In many designs, they are located above the fuel tanks to help minimize the impact of centre of gravity variability related to fuel usage. Numerous aircrafts have been recently certified to the 27.952 requirement with aircraft systems in the vicinity of the fuel tanks. It should be noted that aircraft systems are designed in compliance with the Static Inertia load factor of 27.561(c)(4) to restrain large items of mass subject to a maximum 12G downward acceleration (original cert basis for older aircraft was 4g). If large items of mass were to be included in a 50 feet free fall, the restraints could potentially fail and they could become hazardous to the fuel tanks. However, the	Suggestion is to put the CM on hold and to establish a working group to give further consideration to the feasibility and cost/benefit of mandating compliance for structural items beyond the immediate fuel cell enclosure. In addition, direct the working group to develop new standard for airframe systems crashworthiness using a more holistic energy-based survivable crash description with harmonized design parameters accounting for all potential hazards to the occupants.	Suggestion	Yes	Noted	Refer to response to comment no. 5.

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				drop test does not mandate the inclusion of these hazardous items for the 50 ft drop and thus there is diminished benefit to the occupants by demonstrating only the lesser hazards of mass located below the fuel cell. Based on this observation, 27.952(a)(4) interpretation of the "Surrounding Structure" considers only the immediate surrounding structure for the fuel cell containment. The primary intent of the 50 feet drop test is to validate the fuel bladder and frangible coupling interactions with the surrounding enclosure to ensure that excessive deformation or failure/fracture of it will not lead to fuel leakage. A mandatory demonstration of compliance for relatively small structural features external to the basic cell enclosure is not commensurate with the greater potential hazards to the fuel cell. The 50 feet drop test significantly minimizes the risk of post crash fires in recent survivable crash landing when compared to "prior" 27.952 rotorcrafts. Similar to the Aircraft Systems, any external installation should be substantiated against the 27.601(a) "Design", 527.561(c) "Crash" and 527.727(c) "Ground Clearance" standards. If those standards are not considered to provide a satisfactory level of safety for external installations in the vicinity of fuel tank, a new standard should be created to define a more holistic energy-based survivable crash description with harmonized design parameters accounting for all potential hazards. This could however create more complexity and cost in demonstrating compliance and a cost/benefit analysis should be done to rationalize the introduction of such a standard. With specific reference to the certification memo, clearly, Option 1 is undesirable and economically not feasible to expect a demonstration of compliance by test for every permutation of kit installation in the vicinity of the tanks. Option 3 is not practical since many kit installations are ideally located under the rotor for the same reasons as locating the fuel tanks under the rotor; that is to minimize impact on the aircraft longitudinal cg. Installing protective features would create a weight and design space penalty. Option 2 is really the only option and will be limited to the applicants with the technical knowledge and dynamic structural properties for the fuel tank and surrounding structure. However, option 2 does require a 'fully instrumented' drop test specimen for correlation and is subject to the conditional acceptance for the characteristics and reliability of the baseline simulation. Furthermore, the reliability of the extrapolation for the dynamic simulation may be conditional to the structural configuration and				

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				drop orientation and may not conclusively demonstrate fuel containment and ultimately will be the subject of arbitrary acceptance. The overall cost and weight penalties and constraints on kit configurations may have a negative impact and encourage operators to continue operations with older designs and make the purchase of new designs with significantly improved crashworthiness (in a basic configuration) a much less desirable and postponed alternative.					
8	*GAMA*	General	/	The current and more comprehensive crash resistant fuel system (CRFS) design and test criteria to the airworthiness standards for normal and transport category rotorcraft were introduced as part of FAR 27 AMDT 27-30 and FAR 29 AMDT 29-35 in order to minimize fuel spillage near ignition sources, minimize potential ignition sources and, therefore, improve the evacuation time needed for crew and passengers to escape a post-crash fire (PCF). Prior to the introduction, a thorough research was conducted including a survey of historical safety data to determine the necessity for CRFS standards. Rotorcraft accidents and incidents that resulted in a PCF were studied to define the statistical nature and magnitude of the hazards. The proposed standards (at that time) were further validated by military safety statistics and their adoption would significantly minimize the PCF hazard and its associated fatalities and injuries. Further, a benefit-cost comparison was analyzed with positive outcome to validate the appropriateness of the standards in review. The EASA proposed CM, which mainly targets post TC modification for specific types of rotorcraft mission, is a departure from the acceptable approach used until today and this could become an additional burden for the applicant in term of development, production and operating cost. Today, only the fixed provision of any external installation in the vicinity of rotorcraft fuel tank is considered for the purpose of fuel system drop test article as the compliance means against FAR 27/29.952(a). This approach still remains acceptable for the other certification authorities. It is recommended that additional research data and benefit-cost analysis similar to the above stated but specifically focus on the types of rotorcraft mission requiring an externally mounted hardware under the fuel tank be reviewed and presented to validate the necessity for the proposed CM as part of the public review process. Reference: FAA Notice of Proposed Rulemaking. Notice No. 90-24; Issued on 09/27/90	Suggestion is to put the CM on hold and to establish a working group to give further consideration to the feasibility and cost/benefit of mandating compliance for post cert structural items beyond the immediate fuel cell enclosure.	Suggestion	Yes	Noted	Refer to response to comment no.6.