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PEOPLE'S REPUBLIC OF CHINA**

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**Requirements of flight test risky subject implementation for
civil large and medium-sized fixed-wing unmanned aircraft
system**

民用大中型固定翼无人机系统试飞风险科目实施要求

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3 Terms and definitions

3 adopts the terms of GB/T 35018 and GB/T 38152 and adds four of its own.

3.1 risky subject: a subject that has not been flown in practice, or has been flown only a limited number of times, and that is still hazardous and exploratory in character, or that easily puts the test aircraft into an abnormal state and is thereby hazardous.

3.2 great refit: a modification with a marked effect on the structural strength, the aerodynamic shape, the powerplant, the control system or another functional system of the unmanned aircraft system.

3.3 first flight: the first flight of a new unmanned aircraft system, or of one that has undergone a great refit.

3.4 abnormal state: a flight state or fault state of an unmanned aircraft system that does not conform to the design configuration or that goes beyond the design operating limits.

4 Division and determination of risky subjects

4.1 states the purpose: the test risks are identified, the risk conditions made explicit, the risks analysed and assessed, the risk levels divided and the risky subjects determined, so

that the risk of the test campaign is reduced. During the campaign the risky subjects are screened and analysed continuously against the progress of the test task and the technical condition of the article under test, and the list of risky subjects is completed or extended dynamically where necessary.

4.2 lists seven criteria; a subject meeting any of them is to be entered in the risk list. They are: the first flight of a newly developed unmanned aircraft system; a subject with a certain hazard flown while the flight limits are being extended; a subject that is hazardous and that approaches or exceeds the operating flight envelope while that envelope is being verified; a subject that is hazardous and that verifies the operating limits of the subsystems; the simulation of failures that endanger flight safety and the exploration of ways of clearing them; the first use on the unmanned aircraft system of a new technique, or the first execution of a new exploratory topic, where it carries a hazard; and a hazardous subject for which ground testing is insufficient or impossible because of the limits of the facilities.

4.3 fixes three risk levels by the harm that remains after every precaution has been taken. High risk: a test that can still cause serious harm to people, equipment or property. Medium risk: a test that can still cause harm to people, equipment or property. Low risk: a test that will not cause harm to people, equipment or property.

4.4.1 divides the high-risk subjects into those flown for the first time in the country, whose safety measures have not yet been proved in the air and which are strongly exploratory and highly hazardous, and those whose safety measures have already been proved in the air but which remain highly hazardous and can still have serious consequences if an abnormal state occurs.

4.4.2 divides the medium-risk subjects into those flown for the first time on a given project, fairly exploratory or fairly hazardous, but for which a similar subject has been flown on an unmanned aircraft system of comparable performance and for which the theoretical analysis and the ground testing are reasonably complete; and former high-risk subjects, not first flights, that have been verified successfully over one to three sorties but remain fairly hazardous and still carry a certain risk.

4.4.3 divides the low-risk subjects into medium-risk subjects that have been verified successfully; subjects that have been flown in practice, that have reasonably reliable safety measures and where flight safety can be assured provided the unmanned aircraft test operator handles an abnormal state correctly; and any other subject not entered in the risk list.

4.4.4 refers the safety plan and safety analysis guidance to AP-21-AA-2014-31R1 and AC-21-AA-2022-40 and requires the typical test subjects of an unmanned aircraft system and their risk levels to follow Table 1. Additions to that table, and the final assignment of a level to some subjects, are settled by the flight test organization according to 4.2 to 4.4.

Table 1 has four columns - serial number, subject name, risk level and remark - and runs to

thirty-six numbered lines, several of which share a subject name across two lines that carry different levels. It covers first flights of new aircraft and of aircraft after a great refit, high-speed taxiing, stall and spin, rejected take-off, maximum and minimum level speed, landing at maximum landing weight, service ceiling, plateau flight testing, endurance, simulated failures of the flight control and navigation systems, flight control envelope protection, manual and simulated manual landing, high sink rate landing, crosswind capability, flutter and aeroservoelastic testing, abrupt manoeuvres, air starting of the powerplant, fuel supply reliability with a pump stopped, the emergency power system, jamming resistance of the control link, line-of-sight link range, ferry flights between airspaces, night flying, one station controlling several aircraft, natural icing and flight with simulated ice shapes.

5 Flight test implementation of risky subjects

5.1.1 lists the documents, which include but are not limited to: a flight test programme or plan that analyses the test method, fixes the risk points, analyses and assesses them, determines the risky subjects and their class, and sets out the safety measures, the contingency plan and the conditions and requirements for real-time monitoring; a plan for the theoretical training and simulator training of the operator, where needed; and a flight task card giving the subject, the risk level, the flight conditions, the equipment, the flight limit data and the safety requirements.

5.1.2 lists the preparation work: the technical condition of the unmanned aircraft system is to meet the requirements of the subject; the related ground tests are to have been completed before the risky subject is flown; the operator is to be familiar with the content of the subject, the safety measures and the contingency plan, to be prepared technically and, where needed, to carry out adaptation training on the simulator or a ground rehearsal; the maintenance, airfield services and modification work is to meet the requirements of the subject; the test instrumentation and the real-time monitoring system are to meet the test needs; and any other preparation related to the flight is to be done.

5.2.1 lists what is confirmed before a high-risk subject: the technical condition of the system; the completion of the related ground tests; the technical preparation, that is the risk identification, the risk measures, the contingency plan and the test documents; the personnel preparation, that is the division of duties among the operators, their current flying skill, their training and assessment; the test preparation, that is the technical condition of the internal and external test or monitoring systems and the calibration of the test equipment; the support preparation, that is maintenance support, airfield support and the risk analysis of the support work; the modification preparation, that is the modification made for this flight, the risk analysis after it, the change of weight and centre of gravity and the modification documents; and any other preparation related to the flight. 5.2.2 makes the same list apply to medium-risk subjects.

5.2.3 gives a shorter list for low-risk subjects: the technical condition of the system; the completion of the related ground tests; the technical preparation, that is the risk identification, the contingency plan and the test documents; the personnel preparation; the test preparation; maintenance and airfield support; the modification made for this flight; and any other preparation related to the flight.

5.3.1 governs execution: the flight director of the unmanned aircraft system directs the flight according to the applicable rules; the operators at each station carry out the task as the subject requires; the duty staff and the technical support staff assist the flight director in dealing with faults and special situations; the task is flown according to the flight task card; and if a special situation arises that endangers flight safety, the order to terminate is given at once. 5.3.2 requires the contingency plan to be started immediately if a special situation occurs while the subject is being flown.

5.4 requires a debriefing to be held after the flight, at which suggestions and requirements for improvement are put forward, the content of the debriefing is recorded and the corrective measures are carried through.