



# **EAC**

## **No. 91\_11**

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## Category II Operations

### **EAC91-11.1 GENERAL:**

CAT II operations are defined, for the purpose of this Advisory Circular, as all approach and landing operations conducted in IFR weather conditions in accordance with an instrument approach procedure using CAT II operating minimums. CAT II operating minimums are those minimums which specify a decision height (DH) lower than the equivalent of 200 feet (60 meters) above the touchdown zone but not lower than 100 feet (30 meters) above this elevation and a controlling runway visual range (RVR) below RVR 1800 (550 meters), but not less than RVR 1000 (300 meters). All IFR, AWTA operations with operating minimums less than DH 100 (or no DH) and/or a controlling RVR below RVR 1000 (300 meters) are CAT III operations.

### **EAC91-11.3 Objective of CAT II Operations.**

The essential difference between CAT II and CAT I operations is that a CAT II operation places a greater reliance on the guidance provided by the airborne and ground based equipment. This equipment must be capable of delivering the aircraft to a position from which the cockpit crew can accomplish a transition from instrument to visual flight at a height above touchdown (HAT) of 100 feet and complete the landing in the reduced (CAT II) seeing conditions. The primary objective of CAT II operations is to provide a level of safety equivalent to CAT I precision instrument approach operations even though the seeing conditions in CAT II operations can be much worse than those encountered in CAT I operations. This objective (the equivalent level of safety) is achieved by the following:

- (a) Enhanced reliability and precision in the airborne and ground based equipment to increase the precision of flight path control.
- (b) Enhanced cockpit crew training and qualifications to increase the precision of flight path control. All pilots used in CAT II operations, including seconds-in-command must demonstrate their CAT II proficiency to a company check airman or ECAA Inspector, and be issued a special authorization before conducting CAT II operation.
- (c) Additional visual aids to enhance seeing conditions.
- (d) Additional criteria to ensure obstacle and terrain clearance.
- (e) Additional criteria to ensure ILS signal protection.
- (f) Special operational procedures.
- (g) Special ATC procedures, limitations, or both
- (h) Instrument approach procedures which ensure a safe and orderly transition from the enroute phase of flight to a point on final approach at a HAT of 100 feet from which a visual landing can be made, or a missed approach can be safely executed with a transition through the missed approach segment back to the enroute environment.
- (i) Instrument approach procedures, operational flight procedures, and ATC procedures which ensure protection from obstacles near the landing surface (either fixed or mobile) and which also permit safe go-around from any point in the approach and landing before touchdown.

### **EAC91-11.5 Airborne Equipment Requirements**

- (a) Single Flight Director with dual displays and single Automatic Approach Coupler or two independent Flight Director Systems.
- (b) Instrument Failure Warning System.
- (c) Dual ILS and Glide slope Receivers.
- (d) Equipment for Identification of Decision Height can be:
  - (1) Radar altimeter, or
  - (2) Inner Markers.
- (e) Missed Approach Attitude Guidance can be:
  - (1) Attitude gyros with calibrated pitch markings, or
  - (2) Flight director pitch command, or
  - (3) Computed pitch command.
- (f) Auto Throttle or Auto Thrust System. If operations based on dual flight directors. Also required any aircraft using split axis couplers if applicant cannot show it does not significantly reduce pilot workload.
- (g) Rain Removal Equipment.

- (h) Any other equipment required by the ECAA to enhance safety or to comply with future requirements.

### **EAC91-11.7 Airport Equipment and Procedures Requirements**

- (a) High intensity approach lights.
- (b) High intensity runway edge lights.
- (c) Touchdown zone and centerline lights.
- (d) Runway markings.
- (e) Quality and integrity of the approach and landing ground based guidance systems.
- (f) RVR reporting capabilities and procedures.
- (g) ILS critical area protection.
- (h) Obstacle clearance protection in the approach and missed approach, including the obstacle-free zone.
- (i) Airport surface traffic control.
- (j) Terminal area air traffic control..

### **EAC91-11.9 CAT II Operational Concepts**

The weather conditions in a CAT II operation restrict seeing conditions so that the external visual references necessary to manually control the aircraft are not acquired until the aircraft reaches a very low altitude (typically 150 to 200 feet AGL). Therefore, the cockpit crew must operate and control the aircraft by referring to instruments throughout most of the approach and to a combination of instrument and external visual information during the final stages of the approach, flare, and landing. Because of the reduced maneuvering capability resulting from CAT II seeing conditions, the precision of the flight guidance system and the overall precision of flight path control must ensure that the aircraft can be flown to a position which is closely aligned with the runway centerline, and the desired glide path. The increased reliability and precision required of the airborne and ground based equipment is necessary to ensure that when the aircraft arrives at DH, it is on a flight path which permits the pilot to complete the landing without any significant runway alignment maneuvers. All CAT II operations are conducted in accordance with the DH and RVR concepts used in CAT I operations. Because of the limited seeing conditions available in CAT II weather conditions, however, the additional requirements outlined under the objective of CAT II operations are necessary to assure that an adequate level of safety is maintained when an aircraft is being operated in these conditions.

- (a) Function of Visual Reference. Because of the limitations in the airborne equipment used in CAT II operations and the available instrument guidance, the pilot must have sufficient visual references to manually control and maneuver the aircraft from the DH to a full stop on the runway. These external visual references are required below DH for the pilot to control and maneuver the aircraft, align the aircraft with the runway centerline, touchdown within the touchdown zone, and then rollout on the runway.
- (b) Decision Region. The "decision region" is that portion of the approach between 300 feet AGL and DH where the tracking performance must be critically evaluated to determine whether the overall system performance is sufficient for the aircraft to continue to DH. As previously discussed, the visual scene normally expands as the aircraft descends because of geometric and slant range effects. The pilot must integrate the instrument information with the visual cues, as they become available, and decide before passing DH to either continue the approach by visual reference or to execute a go-around. This information must be integrated and evaluated in the "decision region" and the pilot must make a definitive decision before the aircraft passes DH. While in the "decision region," the cockpit crew should be especially aware of the maximum permissible excursions of the raw, ILS indications (deviations) from which a landing can be safely completed. The tracking performance parameters normally used within the "decision region" are  $\pm 1/3$  dot localizer displacement (maximum) and  $\pm 1/2$  dot glide slope displacement (maximum) with no sustained oscillations about the localizer or glide slope. If the tracking performance is outside of these parameters while within the "decision region," a go-around should be executed because the overall tracking performance is not sufficient to ensure that the aircraft will arrive at the DH on a flight path which permits the landing to be safely completed.

- (c) CAT II DH. The DH is the lowest height to which the approach can be conducted by instrument reference alone. The DH is the minimum height at which the cockpit crew must decide to either continue a CAT II approach by visual reference or to go-around. It is not the point at which the evaluation and decision process is begun. The evaluation and decision process must continue after passing the CAT II DH to assure that sufficient visual references are maintained to manually control and maneuver the aircraft and to assure that the aircraft remains aligned with the runway centerline and will safely touchdown within the touchdown zone. The cockpit crew must immediately execute a missed approach if the required visual references are not maintained or when the pilot cannot determine that a safe landing will be accomplished.
- (d) Purpose of CAT II Operating Minimums. CAT II operating procedures and minimums have been established to ensure that the desired level of safety is achieved when CAT II seeing conditions exist. These operating minimums are based on the DH and RVR concepts. The established operating minimums (DH and RVR) determine the minimum safe heights for instrument flight and the minimum RVR at which the landing can safely be completed by external visual reference in a particular aircraft. These operating minimums are based on established CAT II operational concepts and on the required CAT II airborne equipment, ground based visual and electronic equipment, operating procedures, and pilot training and qualification. These operating minimums, when combined with other CAT II requirements, ensure that the combination of information available from external visual sources and the aircraft instruments and equipment is sufficient to enable properly qualified pilots to safely operate the aircraft along the desired flight path. As the quality and quantity of external visual information decreases due to reduced seeing conditions (when operating minimums are reduced), the quality and quantity of the instrument information and the proficiency of the cockpit crew must be increased to maintain the desired level of safety.
- (e) Establishing Operating Minimums. The operating minimums (DH and RVR) for CAT II operations are usually determined by the tasks the pilot will be required to perform to complete the landing after passing the DH. When establishing operating minimums, consideration is given to the degree of precision in flight path control provided by the required electronic equipment, and the enhanced seeing conditions provided by the required visual aids. Generally, the minimum required seeing condition (RVR) is higher than standard (for example, RVR 1600 (500 meters) when the pilot is required to establish visual reference at a higher altitude (for example, HAT 150) because of obstacles or limitations in the ground based guidance. The RVR minimum is also higher if the pilot has to establish better seeing conditions because of the complexity or difficulty of piloting tasks required to safely complete the landing (for example, factors related to the design or handling characteristics of a particular aircraft). Two basic sets of operating minimums are established for CAT II operations. These are DH 150/RVR 1600 (500 meters) and DH 100/RVR 1000 (300 meters). Most runways which support CAT II operations permit the use of DH 100/RVR 1000 (300 meters) operating minimums. Operating minimums at some runways, however, are restricted to DH 150/RVR 1600 (500 meters) because of limitations in the ground equipment (such as a single RVR reporting system), limitations imposed by the prethreshold terrain (radar altimeter not authorized) and/or obstacle clearance limitations in the final approach surface, the approach light surface, the touchdown area, and the missed approach area.

#### **EAC91-11.11 STANDARD CAT II OPERATIONS**

Standard CAT II operating minimums (DH 100/RVR 1000 (300 meters) are based on the "building block" approach. The building block approach is based on CAT I operations, including standard CAT I requirements, and includes special aeronautical knowledge, experience, skill, training, and qualifications as well as special airborne and ground based equipment. Any special equipment or procedures necessary for the safe conduct of CAT II operations must be specified in the airworthiness certification basis of the aircraft (type certificate or supplemental type certificate) and in the approved aircraft flight manual, or by certification of specified equipment by the manufacturer of the equipment, and operational demonstrations. Operations specifications (OpSpecs)

establish the lowest operating minimums which can be used in any CAT II operation, even if the established instrument approach procedure specifies minimums lower than those values. Special airborne equipment, special ground based equipment and special cockpit crew training required for CAT II operations are specified in this Advisory Circular and the approved aircraft flight manual:

- (a) **Standard CAT II Operating Minimums.** The standard CAT II operating minimums for all aircraft are DH 100 and RVR 1000 (300 meters). The DH must be based on the use of either the inner marker or radio (radar) altimetry. Usually the CAT II DH is based on the use of radio (radar) altimetry. Barometric altimetry is not an acceptable means of establishing the DH for CAT II operations using the standard CAT II minimums (DH 100).
- (b) **Higher Than Standard CAT II Operating Minimums.** The higher than standard CAT II minimums for all aircraft are DH 150 and RVR 1600 (500). These minimums are applied as interim minimums (restricted to higher than standard CAT II minimums) for the first 6 months of operation. The first 6 months are used to validate the effectiveness of the operator's maintenance program to support use of the standard CAT II minimums. These minimums are also applied when there are transmissometer limitations (only one installed), obstacle clearance requirements, or prethreshold terrain limitations (radio (radar) altimeter not authorized) which preclude the use of standard CAT II minimums. DH 150 and RVR 1600 (500 meters) are also the lowest minimums which can be approved when the DH is based on barometric altimetry.
- (c) **Operational Approval Basis.** Standard CAT II operations are approved for an operator by the issuance of OpSpecs which authorize the conduct of CAT II instrument approach procedures at specified airports. The basis for this approval depends on the operating rules applicable to the operation, the complexity of aircraft (turbine powered or reciprocating), and/or the size of the aircraft (large or small). All CAT II operations conducted under ECAR Part 121 are approved in accordance with this Advisory Circular and Part 121.
- (d) **CAT II Flight Guidance and Control Systems.** Standard CAT II operations are based on the use of special airborne and ground based equipment which have capability, reliability, and redundancy superior to the equipment required for CAT I operations. Although CAT II airborne equipment provides increased capability, reliability, and redundancy, the flight control guidance systems used in these operations are not necessarily capable of automatically detecting all potential failures which could significantly disturb the aircraft's flight path (for example "single channel" flight control systems). If such failures occur, the cockpit crew must be able to quickly detect the failure and to intervene manually to continue safely to the approach and landing or execute a missed approach. In other words, standard CAT II operations are based on the use of single channel flight directors, or single channel autopilots, or combinations of both. Even though some CAT II operations are based on dual independent flight directors, each of these systems is usually a single channel system which is not capable of detecting all potential failures. Therefore, even with dual independent flight directors, the cockpit crew must be able to detect failures and manually intervene in certain cases. Standard CAT II operations are also based on the use of: Type II (redundant) ILS ground equipment; dual ILS airborne equipment; radio altimeters (to identify DH); instrument failure detection and warning systems; special missed approach guidance equipment; and rain removal equipment.
- (e) **Airworthiness of CAT II Airborne Equipment.** Throughout the history of CAT II operations, two processes have existed for showing that the airborne equipment of the aircraft is airworthy for CAT II operations. One process is the type design approval process in which approval is obtained during aircraft certification testing. The other is the operational demonstration and approval process in which approval is obtained after the operator demonstrates satisfactory airworthiness of the equipment in actual flight operations. Currently, the most prevalent process is the type design approval process in which approval is contained in the approved aircraft flight manual. Aircraft which have CAT II type design approval are not required to undergo an operational airworthiness demonstration. For aircraft which do not have CAT II type design approval, however, an operational demonstration of CAT II airworthiness is required. Generally, this operational demonstration program

- includes a requirement that the operator conduct at least 300 approaches to 100 feet in CAT I weather conditions using the proposed CAT II system.
- (f) Validation of CAT II Maintenance Program. The airborne system reliability required for the conduct of CAT II operations is achieved by special design requirements and special maintenance programs. The special maintenance programs necessary for CAT II operations are extensive and expensive and are usually the largest factors affecting an operator's decision of whether or not to conduct these operations. When an operator requests authorization to conduct operations with aircraft equipped with standard CAT II equipment, and that aircraft is new to CAT II operations with the operator, all CAT II operations with those aircraft shall be initially restricted (for at least 6 months) to higher than standard operating minimums (DH 150 and RVR 1600 (500 meters)). This restriction must remain in place until the operator has successfully validated its maintenance program.
  - (g) Airports and Runways. All CAT II operations are restricted to airports and runways which meet the special safety requirements necessary for CAT II operations. All approved CAT II airport and runway operations are conducted in accordance with approved CAT II instrument approach procedures. In the U.S. CAT II operations shall only be conducted in accordance with an approved FAR Part 97, CAT II instrument approach procedure. In foreign countries, CAT II operations conducted by Egyptian operators are restricted to those runways specifically approved for CAT II operations by that state or country.
  - (h) Operations Requiring Special Airborne Capabilities. Certain aircraft with unique handling characteristics or unique design features may be required to have special airborne capabilities to permit CAT II operations to be safely conducted. These special airborne capabilities are used to enhance handling characteristics during manual flight (stability augmentation systems), to enhance flight path control during flare and touchdown (automatic landing systems). Some aircraft such as the B-747 must have auto land capability to conduct standard CAT II operations (DH 100 and RVR 1000 (300 meters)). All CAT II operations with the B-747 using operating minimums below DH 150/RVR 1600 (500 meters) must be predicated on the use of the automatic landing system. Either manually flown or auto coupled CAT II operations can be conducted with the B-747 using higher than standard operating minimums (DH 150/RVR 1600).

#### **EAC91-11.13 CAT II Terminal Instrument Approach Procedures**

The OpSpecs is used to specify the CAT II instrument approach procedures, CAT II approach and landing minimums, and the aircraft that a particular operator is authorized to use in CAT II operations. If the cockpit crew is properly trained and qualified, and the aircraft is properly equipped and maintained, an operator can be authorized to conduct CAT II operations to airports and runways where the CAT II instrument approach procedure is prescribed by any of the following:

- (a) OpSpecs .
- (b) US Part 97.
- (c) Prescribed or approved by the government of an ICAO contracting state.

#### **EAC91-11.15 Foreign CAT II Instrument Approach Procedures.**

- (a) Degree of Equivalence. The CAT II ground based systems and approach procedures at foreign airports may not be exactly in accordance with ECAA standards. As a result, it is critical that the information and functions necessary for CAT II operations (as provided by the ground based systems and approval procedures at the foreign airports) are consistent with the intent of CAT II standards.
- (b) Authorizing Foreign Airports/Runways. The standard OpSpecs establish the conditions which must be met for all CAT II operations at foreign airports and runways. This document is used to authorize, restrict, or deny the use of foreign, CAT II instrument approach procedures. This includes all foreign CAT II instrument approach procedures developed by the following types of foreign countries:
  - (1) ICAO contracting states (ICAO members).
  - (2) Non-ICAO countries (non-ICAO members).
  - (3) Countries in which the U.S. has developed the CAT II instrument approach procedure for the foreign country.

**EAC91-11.17 Foreign CAT II Operations in the U.S.**

The airborne equipment, pilot training, and pilot qualification standards required for CAT II operations by foreign authorities and foreign operators may not be in exact accordance with U.S. standards. For safety reasons, however, it is essential that foreign operators conduct CAT II operations in the U.S. in a manner which is consistent with the intent of U.S. CAT II standards. The foreign operator's aviation authority (State of the operator) has prime responsibility for determining that the operator complies with the special requirements that the foreign aviation authority has specified for CAT II operations at any airport, including U.S. airports. The State of the operator also has prime responsibility for authorizing and restricting operating minimums for any operation by the foreign operator.

- (a) General Policies. When evaluating a request by a foreign operator to conduct CAT II operations within the U.S., the FAA applies the following policies associated with the unique nature of these operations and with the responsibilities of the State of the operator:
- (1) A foreign operator will not be authorized to conduct CAT II operations in the U.S. unless that operator is authorized by its foreign aviation authority to conduct CAT II operations.
  - (2) Foreign operators will not be authorized to use CAT II operating minimums in the U.S. that are lower than the CAT II operating minimums authorized by the foreign aviation authority for CAT II operations.
  - (3) Foreign operators will not be authorized to use CAT II operating minimums in the U.S. that are lower than the lowest minimums authorized for a comparably equipped U.S. operator.
  - (4) All CAT II operations conducted by foreign operators in the U.S. must be conducted in accordance with a FAR Part 97, CAT II instrument approach procedure.
  - (5) The foreign operator must provide documentation to the FAA which confirms that its foreign aviation authority has determined that the CAT II program to be used is equivalent to the program required in FAA Advisory Circular 120-29 A.
  - (6) The foreign aviation authority must confirm that the foreign operator is authorized to conduct CAT II operations with a particular aircraft type, and that its flight operations and maintenance programs are equivalent to U.S. CAT II standards. Usually this confirmation satisfies the FAA's responsibility for determining whether the operator's aircraft are properly equipped and maintained and whether the operator's cockpit crews are properly trained and qualified for CAT II operations.
- (b) Foreign Operator CAT II Approach and Landing Minimums. The criteria in US AC 120-29A establish the lowest approach and landing minimums which can be authorized, under any circumstances, for foreign CAT II operations in the U.S. The CAT II operating minimums authorized for a particular foreign operator are specified in the FAR Part 129 OpSpecs in a manner similar to minimums specified for U.S. operators. The FAA will not, however, authorize a foreign operator to use CAT II operating minimums lower than the values authorized by the foreign aviation authority. The airborne equipment required by US AC 120-29 A and any additional equipment required by the foreign aviation authority for CAT II operations must also be specified in the FAR Part 129 A OpSpecs.
- (1) Standard CAT II Operating Minimums. If a foreign operator has at least 6 months of satisfactory experience conducting CAT II operations with a particular aircraft type, that operator can be authorized to use standard CAT II minimums (DH 100/RVR 1000 (300 meters) in the U.S. with that aircraft. This requirement can be met with 6 months of satisfactory experience with that aircraft type in CAT II operations in any country, without obtaining any of the CAT II experience in the U.S.
  - (2) Higher Than Standard CAT II Operating Minimums. If an operator does not have at least 6 months of satisfactory experience in conducting CAT II operations with a particular aircraft type, that operator shall be restricted to higher than standard CAT II operating minimums (DH 150/RVR 1600 (500 meters) until it completes a 6 month demonstration program. Because of the

high degree of international standardization for CAT II facilities, the data collected during this demonstration program can be obtained at foreign airports as well as US facilities. Following the completion of this demonstration program, the foreign operator does not need to submit demonstration data to the FAA; however the FAA must issue FAR Part 129 operations specification to the operator approving the lower minimums.

### **EAC91-11.19CAT II Evaluation and Approval Process**

(a) General Criteria:

- (1) Operations are restricted to those aircraft which are properly equipped and airworthy for the CAT II operations being conducted.
- (2) Compliance with regulatory requirements for the operations.
- (3) Compliance with the requirements of Part C of the standard OpSpecs.
- (4) Compliance with the CAT II criteria of US AC 120-29 A and ECAR Part 121 or 91, (as applicable).
- (5) Accepted, safe operating practices are provided.
- (6) The use of the concepts of stabilized approach and decision region in all CAT II operations is required.
- (7) CAT II operations are restricted to those pilots who are properly trained, experienced, qualified, and proficient for CAT II operations.
- (8) CAT II operations are restricted to those airports and runways which meet CAT II requirements.

(b) Airport, Runway, and Ground Based Equipment Requirements. The suitability of the airport and runway for the type of aircraft and the operation being conducted is an integral part of the ECAA evaluation and approval of CAT II operations. The basic requirements for standard CAT I operations and the performance requirements in the applicable operating rules address the majority of the criteria required for CAT II operations. In the operating concepts and criteria for CAT II operations, however, it is required that certain other factors be considered. The ECAA must ensure that the operator fully understands CAT II operational requirements and that the company manuals and training programs provide the policy, guidance, training, and procedures necessary to ensure that these other factors are adequately addressed. When evaluating an operator's overall CAT II operations program, the ECAA must consider whether the program accounts for the following factors when designating airports to support CAT II operations:

- (1) Suitability of the runways, runway field lengths, taxiways, and other maneuvering areas on the airport, considering the restricted seeing conditions associated with CAT II operations.
- (2) CAT II instrument approach procedures and NAVAIDs to be used.
- (3) Procedures for CAT II protection of the runway safety areas, obstacle-free zones, and ILS critical areas, as well as runway and taxiway incursion prevention procedures in CAT II weather conditions.
- (4) ATC facilities and services required for CAT II operations.
- (5) Required safety facilities and services (such as crash, fire, and rescue) and any special procedures needed for the CAT II operations.
- (6) RVR reporting and weather reporting and forecasting services.
- (7) Aeronautical information services related to these operations (such as NOTAMs and ATIS).
- (8) Adequacy of lighting, marking, and other visual aids necessary to support CAT II operations.
- (9) Necessity for prohibiting CAT II operations at airports and runways which are not approved for CAT II operations.

### **EAC91-11.21 Application process**

(a) Operators should submit an application to the FSSS that contains information in the form and manner prescribed by the ECAA. Each operator must submit his application at least 60 days before the date of intended operation along with the following:

- (1) Eligibility Airworthiness Documents: Sufficient documentation should be available to establish that the aircraft has an appropriate AFM, AFM

- Supplement (AFMS), if applicable, and is otherwise suitably qualified for CAT II operations.
- (2) Description of Aircraft Equipment to be used for CAT II operations.
  - (3) Training programs for pilots and maintenance personnel.
  - (4) Operational Manuals and Checklists.
  - (5) Operating history that identifies relevant past problems and incidents, if any, and actions taken to correct the situation.
  - (6) Minimum Equipment List (MEL) relevant updates.
  - (7) Maintenance program relevant updates.
  - (8) Operating Practices and Procedures.
- (b) System evaluation;  
Should be approved from the manufacturer to conform to FAA AC120-29 A standards or equivalent. Each Aircraft type that an operator intends to use in for CAT II operations must receive airworthiness approval **prior** to the operational approval being granted.
- (c) Equipment approval criteria:  
Airborne navigation instrument and/or flight control equipment may be eligible for installation approval as part of an installed system when it is:
- (1) Found to comply with the requirements of an applicable technical standard order,  
or
  - (2) Approved as part of an airplane under a type certificate or supplemental type certificate, or
  - (3) Found to comply with other pertinent specifications approved by the ECAA, such as military standards or a foreign government's standards.