



**STANDARDIZATION OF HELICOPTER CERTIFICATION
REQUIREMENTS IN THE WESTERN WORLD**

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ABSTRACT

The first needs for a standardization of certification regulations were felt as the CONCORDE and AIRBUS programmes were developed in cooperation.

This standardization limited to European borders at the time led in particular to the drafting of JAR 25. Although this regulation does not meet every industrialists expectation, it at least helped make Europe credible vis-a-vis the U.S.A. Contrarily to aeroplane manufacturers and considering their specific problems, the European helicopter manufacturers judged European standardization to be insufficient and set up a standardization procedure for helicopter certification regulations in the Western World at the beginning of 1983.

This procedure was approved by the US helicopter industry and concluded with an agreement between the European (AASC) and US (FAA) Airworthiness Authorities in April 1983.

Administrative and political problems will prevent drafting a truly universal set of regulations for a long time to come but the good will of the main Airworthiness Authorities concerned is a good omen for the furtherance of the procedure implemented. My expose is a reminder in this direction.

1 - BACKGROUND

This need for statutory measures was felt during the first joint European programmes for transport aircraft (CONCORDE and AIRBUS).

The first plans for standardizing certification regulations on a European scale began to take shape in 1967/1968 with preliminary contacts between the Society of British Aircraft Constructors (SBAC) and the Groupement des Industries Françaises Aéronautiques et Spatiales (GIFAS), which grew rapidly to include the German Federal Aeronautical and Spatial Industrial Association (BDLI) and FOKKER company (the Netherlands).

At the same time the Anglo French authorities began to consider the same possibilities on an official level.

The four pioneer countries (France, Great Britain, West Germany, (the Netherlands) were rapidly joined by the majority of the European Countries (Belgium, Denmark, Spain, Finland, Italy, Norway, Sweden, Switzerland).

These courses of action set in motion by the manufacturers and the authorities led to the formation in 1970 of a common group which later became the JSC (Joint Steering Committee), with the following objectives :

- The creation of common airworthiness codes in Europe, acknowledged as national codes, in order to facilitate :
 - the certification of aircraft built under joint programmes,
 - the importation and exportation of aeronautical products.
- The establishment of a single certification procedure for the member countries.
- The establishment of a common European certification authority (C.C.O. : Central Certification Organization).

The first objective is under way and to date the following common codes have been created (JAR : Joint Airworthiness Requirements).

JAR 1	Definitions and Abbreviations
JAR 22	Sailplanes and Powered Sailplanes
* JAR 25	Large Aeroplanes
JAR-APU	Auxiliary Power Unit
JAR-E	Engines
JAR-P	Propellers

- * As regards JAR 25, to date it has been acknowledged as the **only** national code by only four countries (France, West Germany, the Netherlands, Great Britain).

The other two objectives have not yet been broached although Sweden has set up a trial joint certification procedure for the SF 340, as per JAR 25, for the JAR organization member countries, and AIRBUS Industries are planning a joint technical assessment for the A 320 by the four countries which have adopted the JAR 25 as the only national code (France, Great Britain, West Germany, the Netherlands).

2 – EXPERIENCE OF JAR 25

The JAR 25 for Transport Aircraft was first published in part in 1974.

It represents an important counterweight to the FAR 25 with the result that the European authorities airworthiness group (AASC) is nowadays very highly thought of by the FAA. Nevertheless this regulation is packed with a large number of national variants, some more justified than others, which represent a serious obstacle in achieving the first two objectives aimed at within Europe.

Thus, on the 1st. January 1984 the following number of national variants existed :

France	33
West Germany	5
Italy	36
The Netherlands	4
Great Britain	42

Whatsmore, the basic regulation differs too much from the FAR 25 and does not therefore solve the important problem of relations between the different European countries and the United States, or the other countries which use the FAR as the national certification regulations.

In practice, the JAR 25 has only been applied for the BAE 146 and is being completed for the SF 340 so it is still too early to form an opinion as to its outcome and its effects on costs, empty weight or performance.

It is also due to be used for the ATR 42 and the A 320, and has given rise to strong objections on the part of Airbus Industries because of the resulting disadvantages with respect to the FAR 25. Moreover, the very large number of national variants is now generally frowned upon and the different countries have undertaken to try to reduce their number.

The JAR 25 can however be considered as a success, notably on account of the credibility it has achieved for Europe vis-à-vis the United States.

3 – HELICOPTER REGULATIONS

3.1 – Current Situation

The development of the helicopter civil market and the rapid increase in the certifications required have made these certification procedures complex and expensive for the manufacturers. The main reason for these difficulties is the existence of two regulations with very different objectives and content : FAR Part 27/29 and the BCAR section G. We feel that safety is a universal concept which should be understood in the same way by all the countries as far as the basic regulations are concerned (the particularities of local uses should only be treated through the operational regulations).

Based on this principle it is incomprehensible from a technical standpoint that the certification regulations, which should be the means of obtaining at least this universal safety level from the manufacturers, are in fact different, sometimes very different, from one country to another, and often without there being any evidence that one is better than the other as far as safety is concerned.

This is just the case at the moment for FAR 27/29 and BCAR section G which require completely different demonstrations of the manufacturers to substantiate the same things.

The manufacturers are often put to great expense simply to comply exactly with the requirements of each of the regulations without there being any positive effect on the safety of the aircraft.

It would be much more reasonable and to everyone's advantage (Authorities, manufacturers and the public) that this expenditure be used directly to improve safety.

Two typical examples of regulation differences requiring costly substantiations which have no effect on the aircraft safety are described below.

1) Power Transmission System Endurance Test

This very important test which must usually be carried out on an aircraft attached to the ground in order to be truly representative, is completely different as far as its duration, power spectrum, or its miscellaneous procedures are concerned, according to whether the FAR 27/29 or BCAR/G are applied. No doubt, very little would be gained from trying to find the reasons for this.

The Power Spectrums versus time indicated in figures 1 to 4 are enough to illustrate unjustified incoherence which need to be standardized.

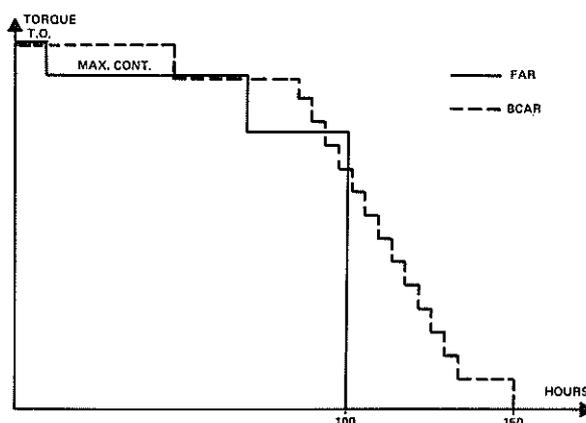


Fig. 1 TRANSMISSION ENDURANCE TEST SINGLE ENGINE FAR 27

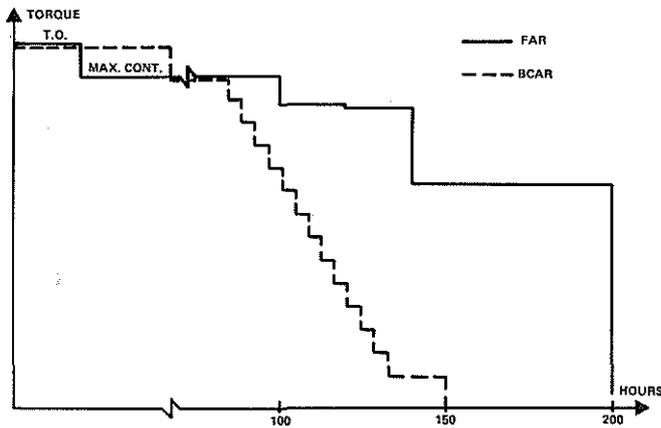


Fig. 2 TRANSMISSION ENDURANCE TEST SINGLE ENGINE FAR 29

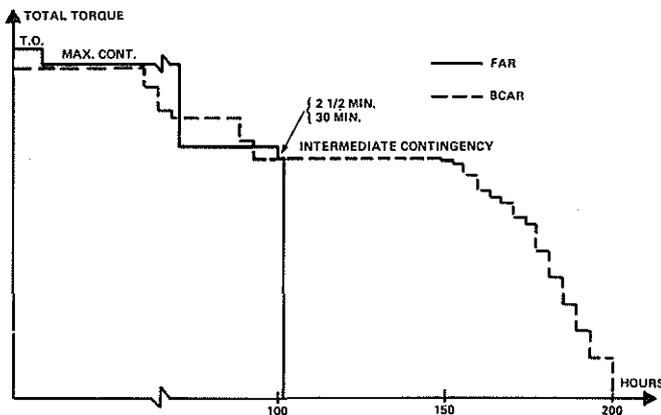


Fig. 3 TRANSMISSION ENDURANCE TEST TWIN ENGINE FAR 27

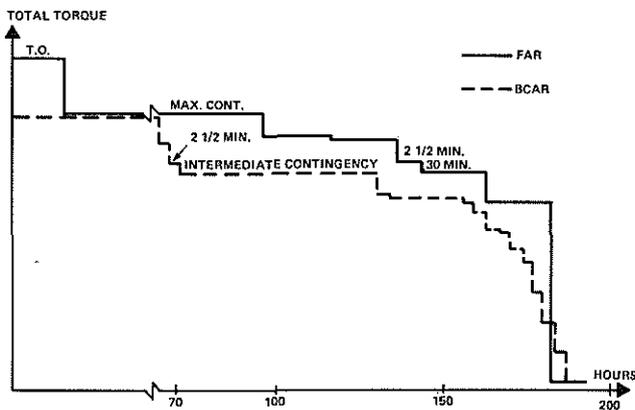


Fig. 4 TRANSMISSION ENDURANCE TEST TWIN ENGINE FAR 29

2) Category A (FAA) and Group A (CAA), Takeoff Paths (Clear heliport with allowance for engine failure)

These takeoff path criteria, the purpose of which is to define the takeoff weights and distances in the conditions of critical engine failure, require costly supplementary Group A flight tests and special Flight Manuals for the

Category A and Group A. The diagrams of figures 5 and 6, which correspond to the clear heliport takeoff paths, clearly illustrate the differences which exist at the moment, and for which there is absolutely no reason to prevent them from being standardized.

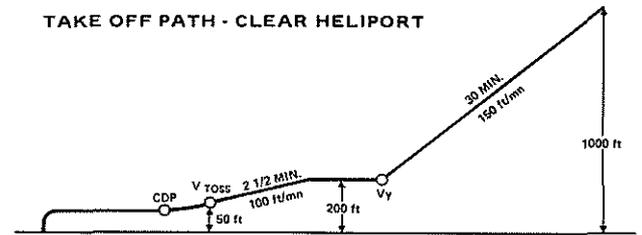


Fig. 5 FAA - PART 29 CATEGORY A

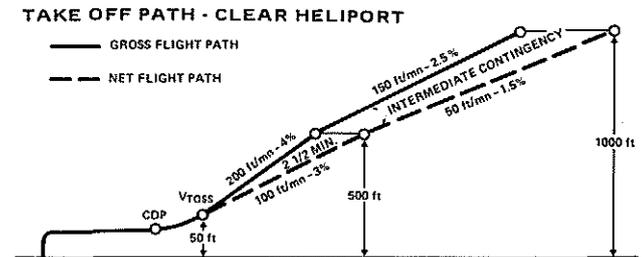


Fig. 6 CAA - BCAR / G GROUP A

Numerous other, more general differences exist between the FAR 27/29 and the BCAR/G ; on the whole, they constitute an important work load and incur considerable expense for the manufacturers when certifications must be obtained according to the FAR and the BCAR for a single aircraft. For example, this is the case for the following main points :

- Design load factors for crash conditions
- Pilot control loads
- Recovery time after A.P failure recognition
- IFR certification criteria
- Emergency flotation gear standard/substantiation
- Liferaft standard
- Substantiation of collision with birds
- Endurance in flight on battery
- Fire resistance - fireproofing test requirements
- Maximum continuous icing parameters
- Separate ventilation of the electric generators or equipment
- Substantiation of fuel jettisoning equipment
- Required instruments and markings
- etc .

It would worth standardizing all these points, which must be dealt with by the manufacturers with an overall coverage when the FAR and BCAR regulations must be met and when they are compatible, on the basis of the FAR or BCAR criteria. But there again, there is absolutely no justification for maintaining such differences in the regulations.

3.2 — Standardization of Helicopter Regulations

3.2.1 — Background

After completing the JAR 25 in 1974, the European authorities planned to carry on the European regulation activities with the JAR 29 and 27. This eventuality led to the formation in 1975 of the AECMA helicopter group which brought together the industrialists from the four manufacturing countries (West Germany, France, Great Britain, Italy).

This work group then set out to examine the problems involved in creating European certification regulations and to define the industry's position as to the advisability of starting these activities.

In view of their recent certification experiences the European manufacturers were immediately motivated by the idea of regulation standardization, but in view of the prime importance of the North American civil market the need was felt not just for standardization within Europe but also between Europe and the United States of America.

The fact was that, unlike aeroplanes, the distribution of the civil helicopter market was such that the creation of JAR regulations was of no practical use ; it even represented considerable inconvenience from an industrial and commercial standpoint as was illustrated by the example of engine power ratings which was presented at the time.

Engine Power Ratings

As, was confirmed later, in 1969 in France it was decided that the certification regulations for engines would be the CTG 001, identical with the BCAR Section C with its particular ratings concerning helicopter engines :

- One-hour power rating for single-engine helicopters (instead of the 5-minute takeoff power rating in FAR 33)
- Intermediate contingency power rating with no time limit in the event of engine failure for multi-engine helicopters (instead of the «30-minute» power rating in FAR 33).

The particular engine endurance test which the French engine manufacturer concerned was obliged to carry out required that the power levels to be substantiated be limited in view of the operating times at the above-mentioned power ratings.

This resulted in a direct penalization of the performance of both the helicopters certified at the time with engines which complied with the CTG 001 regulations :

- The GAZELLE 341G fitted with a TURBOMECA AS-TAZOU III A engine was subjected to an 80 kg takeoff weight penalty in the temperature limitation area, i.e. 15 % of its payload.
- The PUMA 330F fitted with two TURBOMECA TURMO IV A engines was subjected to a 500 Kg takeoff weight penalty (Category A, clear heliport) in temperature limitation area, i.e. 23 % of its payload.

This example prefigured well the difficulties that the European manufacturers would inevitably encounter with a JAR regulation very different and more penalizing than the FAR ; hence as early as 1976 the AECMA helicopter group pronounced their majority decision against the creation of JAR regulations different from the FAR 27 and 29. This position was presented to the European authorities during the January 1976 JSC meeting.

At this time the AECMA helicopter group was also preparing a series of modification propositions for FAR 27, 29 and 33 in an attempt to bring these FAA regulations close to the European practices considered to be better ; these propositions were transmitted to the European authorities and to the FAA at the Regulatory Reviews in 1978 (Aircraft Engines) and 1979 (Rotorcraft). This attempt did not meet with much success at the time for two reasons :

- There was no close communication between the European and American helicopter manufacturers organizations which was the only way in which it would have been possible to make the American manufacturers fully appreciate the mutual advantages of standardized regulations.
- The FAA, sure of its superiority throughout the world as regards regulations saw absolutely no reason to consider the opinions of a Europe which was then only taking its first steps in its organization concerning airworthiness

3.2.2 — Present Position

This position progressed at the beginning of the 1980's on these same two points :

- The HAA (Helicopter Association of America) became the HAI (Helicopter Association International) in January 1981 and its airworthiness committee established close, co-ordinated relations between the European and American manufacturers, and in particular strove to obtain better mutual understanding.
- The JAR regulation system continued its organization and finally became credible to the FAA, mainly thanks to JAR 25.

Then, from 1981, the AECMA helicopter group attempted to approach the American manufacturers and then the FAA/SW (Helicopter Directorate) unofficially with the idea of standardized helicopter regulations based on «improved» FAR 27 and 29.

The opinions expressed during these approaches were sufficiently encouraging to strengthen the AECMA in its previous position which was updated and again presented at the JSC meeting held in Paris in May 1982, with the desire for a single world-wide regulation expressed for the first time.

Meanwhile, and without any discussion with the industry, the ICAO, for its part, set up in 1980 the preliminary operations for the «HELIOPS Study Group» which led to the creation of HELIOPS Panel in July 1982 ; the real work by this panel began at the Montreal meeting in March 1983.

This initiative did not seem to be particularly favourable in that certain aspects of the work schedule directly concern certification regulations, hence the danger of new regulation

positions, different from the FAR or BCAR, being defined.

It is to be hoped, therefore, that these activities will be abandoned by the ICAO, and left to groups of more qualified experts. However, the ICAO HELIOPS Group should be encouraged to work towards the standardization of the operational requirements of the different countries, since that is its primary objective. This international structure is in fact the only one capable of achieving a positive result in this field.

3.2.3 — Prospects of Achieving Standardization

At the beginning of 1983 the encouraging opinions from the other side of the Atlantic, but also the danger of seeing yet another new regulation being introduced by the ICAO, prompted the AECMA to officially engage its action of internationalizing helicopter certification regulations world wide.

In view of the current established universality of the FAR regulations and their safety level considered on the whole to be adequate, it is FAR 27 and 29 which were chosen by the European manufacturers as the basis of possible joint regulations, with, however, the intention of having them modified on the points considered to be essential or better at the European level (points taken in particular from the BCAR, Section G).

Based on this hypothesis, the plan of action proposed by the AECMA to try to achieve this standardization is the following :

- 1) At the European level : Letter from each of the four manufacturers to its authority explaining the position of the AECMA and asking for the points on which the FAR 27 and 29 would need to be modified in order to be considered acceptable as national regulations together with their support in front of the AASC and the FAA.
- 2) Coordination AECMA/HAI to define an official joint position and to draw up a joint proposition for the improvement of FAR 27 and 29.
- 3) Coordination between the different authorities concerned, European and American (on the basis of a preliminary agreement between the manufacturers) on the principle of standardizing the certification regulations for the western world, based on FAR 27 and 29.
- 4) Drawing up, by the authorities and the industry, of the modifications to the FAR 27 and 29 deemed necessary to make them acceptable on a world wide level, and establishment of a subsequent plan for updating these regulations.

Phases 1, 2 and 3 are now well under way with both the manufacturers and the authorities.

In fact, the European manufacturers officially informed their authorities of their intentions in January 1983, and all except the CAA were in agreement. But the most important fact was the meeting held in WASHINGTON in April 1983 between the JAR authorities and the FAA and to which representatives of the industry were partly invited.

This was the occasion, during the session attributed to helicopters, 13th. April, 1983, for the HAI and AECMA, to officialize their joint position for unification of the existing regulations. This joint appeal by the European and American industries was heard by both the FAA and the AASC.

The FAA accepted the principle of taking the European ideas into account and their introduction into the FAR 27 and 29 so that they can be recognized as universal, in particular by Europe.

In view of this engagement by the FAA, the AASC accepted the principle of co-operation with the FAA and made it clear that the JAR helicopters would not be put into operation to ensure the success of the cooperation with the FAA i.e. the realization of the European particularities. The CAA for its part, fully supported the AASC position and promised to rewrite the BCAR-G in the form of the FAR in order to prepare the subsequent comparison with a view to preparing the modifications to the FAR 27 and 29.

This position of the AASC (and of the CAA) was confirmed during the JSC meetings which followed the Washington meeting, in particular the one held in STOCKHOLM in June 1983. The officialization of the FAA position took the form of a supplementary «Task» introduced into the ROTORCRAFT MASTER PLAN on the 4th. May, 1983 and updated the 30th. September, 1983 (See Figure 7).

AVS RESUME		Resume No. SW-17	
Date of Resume: 4/15/83	Date Deferred/Cancelled:		
Date of Revision: 9/30/83	Final Completion:		
PROJECT TITLE: Rotorcraft Certification Requirements Coordination With European Airworthiness Authorities Steering Committee (AASC)			
PRINCIPAL SPECIALIST(S): ASW-100, (817) 877-2581 ASW-110, (817) 877-2584 ASW-111, (817) 877-2550 ASW-7, (817) 877-2434			
OBJECTIVE: Allow FAR's 27 and 29 to become acceptable codes for type certification of rotorcraft by all AASC authorities, thus relieving the possible need for JAR's 27 and 29.			
REQUIREMENT: This project developed from proposals advanced at a meeting between the FAA and AASC to standardize, as far as practical, rotorcraft certification rules.			
MILESTONE SCHEDULE:			
	Scheduled Completion	Revised Scheduled Completion	Actual Completion
1. Ltr. to AASC and industry on key issues			5/83
2. End of answer period			11/83*
3. End of consideration by ASW	1/84		
4. Reception of comprehensive list by AASC	5/85		
5. Consideration and preparation of rule	9/85		
6. Publish in Federal Register	11/86		
7. Update AC 29-X, AC 27-X	11/86		
8. Obtain confirmation by AASC of general acceptability of FAR's 27 and 29	2/87		
*Some consideration will be allowed for late comment.			
STATUS:			
REMARKS/NOTES:			

Fig. 7 ROTORCRAFT MASTER PLAN

The time schedule proposed by the FAA, may appear slightly optimistic in view of the complexity of the administrative problem, but it is already engaged, (Points 1 and 2 are already closed) with the participation of the AASC and the industry grouped within the HAI (AIA + AECMA).

The chances of success of the procedure engaged now depends on the goodwill of all those involved.

As regards the authorities, and more particularly the European authorities, it is the still awaited position of the CAA which is the most worrying.

It is in fact quite understandable that the CAA should be disappointed at having to abandon its BCAR section G regulation to which it had devoted a lot of its efforts over these last few years to update it, however, the CAA must also acknowledge the representativity of the FAR throughout the world, and that in the best interests even of the UK industry.

Also, a too maximalist CAA position, within the scope of the engaged cooperation procedure, could well jeopardize any chance of obtaining an acceptable compromise for all the parties concerned and hence the universality of regulations so much wished for by the industry.

The industry, for its part, acknowledges the high quality of the BCAR regulation and is prepared to support the

introduction into the FAR 27 and 29 of a number of BCAR section G points ; discussions to this end are being held between the AECMA and the HAI and they should succeed during 1984.

4 – CONCLUSION

The enormous expenses engaged simply to meet the current different regulations would be considerably profitable to the aircraft safety and, hence to the public, if they could be assigned to it in full.

For its part, the industry would be much more open to the progress of the regulations if they were applicable to all, irrespective of the countries of manufacture and operation.

The industry once again takes the opportunity offered by this platform to ask all concerned to cooperate with the best will in the principle of standardizing the certification regulations throughout the world.