SAFETY REGULATION - THE FIRST 100 YEARS

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SUMMARY

The safety regulation of aviation began in Great Britain 100 years ago. This paper traces the major stages in the development of regulation from that earliest step up to the formation of the European Aviation Safety Authority (EASA).

The interplay between the regulatory authority and the industry which it regulated is described and the interaction with the various supra-national bodies such as ICAN and ICAO is set out. Examples are given of the way in which accidents have helped to shape standards.

Throughout the early development of aviation a lot of attention was devoted to airworthiness, so there is much emphasis on it in this paper. However, most accidents have historically originated in operational causes and the broad steps in operational regulation are also described.

The factors which drove the development of the European Joint Aviation Authorities are examined, and the paper also sets out the broad structure of EASA when it first commenced its role.

1. Introduction

Aviation and regulation seem to go hand in hand, and many may feel that, if anything, aviation suffers from a surfeit of control. Of course, the situation that we see today was not created overnight. Rather it is the end product of a continually developing situation and the history of that development, interesting in its own right, is also a useful guide as to why things are the way they are. At a time when great changes to the process of regulation in Europe have taken place, a review of history can form the basis of a useful check list to ensure that nothing of significant value has been lost in the change. Aviation is good at learning lessons from experience. Regrettably from time to time it has also forgotten one or two!

Any historical review of a 100-year period can only be cursory if it is to be contained in a short paper. To limit the scope somewhat, this presentation will conclude with the formation of the EASA. None-the-less, it will only be possible to touch on some of the highlights, and inevitably one person's highlight may be of minor interest to someone else. But the broad framework of development can, it is hoped, be shown.
The form and content of regulation can take many forms, as the differences which have existed between UK and US requirements well illustrate. The main thrust of aviation development, the interests of industry in developing certain types of aircraft, the general legal framework within which the system has to operate, and most importantly the people involved all play their part, as does the international environment and some of these threads will be explored in the present paper.

2. First Steps in Great Britain

Formal control of civil aviation in Great Britain began with the Aerial Navigation Act of 1911. Civil aviation law became the responsibility of the Home Office, and the sole concern was the protection of people on the ground. The Act also gave the Board of Trade responsibilities relating to the registration and certification of aircraft and pilots. However, the Aerial Navigation Act of 1913 transferred control to the Secretary of State for War. It was largely concerned with defence matters, and introduced prohibited areas, corridors of entry and compulsory landing grounds. The 1914-1918 conflict brought with it a ban on civil aviation except for flights within three miles of a recognized aerodrome. In 1916 an Air Board was formed which was to play a significant part in the post-war control of civil aviation.

3. Post World War I

The experiences of war and the considerable development of aviation during the wartime years clearly suggested that civil aviation had a role to play, and that some form of governmental control would be necessary. In the months following the Armistice in 1918 a number of regulations were put in place so that civil flying could officially recommence on 1st May 1919 under the supervision of a Department of Civil Aviation, the formation of which had been announced to Parliament on February 12th 1919. The first Controller General of Civil Aviation was F H Sykes (later Sir Frederick) and it is interesting to note some of the information contained in his first (initially 6-monthly) "Synopsis of Progress of Work in the Dept. of Civil Aviation, 1st May 1919 to 31st October 1919".

Table 1

| Number of hours flown | 4,000 |
| Number of flights     | 21,000|
| Number of passengers  | 52,000|
| Approximate mileage   | 30,300|
| Number of accidents   | 13    |
| Number of fatal accidents | 2  |
Table 2

<table>
<thead>
<tr>
<th></th>
<th>Total Number</th>
<th>Per 1000 flights</th>
<th>Per 1000 hours flown</th>
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<tbody>
<tr>
<td>Pilots killed</td>
<td>2</td>
<td>0.095</td>
<td>0.5</td>
</tr>
<tr>
<td>Pilots injured</td>
<td>6</td>
<td>0.286</td>
<td>1.5</td>
</tr>
<tr>
<td>Pass. killed</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pass. injured</td>
<td>10</td>
<td>0.476</td>
<td>2.5</td>
</tr>
</tbody>
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It was possible, therefore, for Mr. Sykes to report that "for every 5,200 passengers carried only 1 has been injured."

Provisional arrangements had been made for British commercial aircraft to visit Amsterdam, Brussels, Christiania, Copenhagen, Lausanne, Madrid, Paris and Stockholm.

Considerable attention was paid in this first report, as in many subsequent ones, to the development of Imperial Air Routes, which though not directly relevant to the issue of safety regulation undoubtedly coloured the thinking of those concerned - as exemplified some years later by the development of airships with their attendant problems.

In addition to noting the introduction of the Air Navigation Regulations, another positive step towards easing the task of navigation was noted. Names were marked on the roofs of the railway stations at Ashford, Hitchin, Redhill and Tonbridge. Some might welcome a continuation of that practice today, though doubtless there would be an argument as to who should pay for the work!

Along somewhat similar lines, when the decision was taken to operate a regular air service between Palestine and Iraq, which was approved by a conference in Cairo in 1921 and was to be operated by the RAF, the advantages to navigation which came from the ability to follow railway lines were noted. No such facility existed between Aman and Ramadi, the two points to be linked. The decision was taken to emulate a railway by ploughing a furrow through the desert between them, a distance of 470 miles. This was duly done, and the RAF “flew the furrow” for 5 ½ years.

In his autobiography \(^2\) Sir Frederick Sykes notes "By dint of superhuman exertions, we managed to get the British Air Navigation Regulations for Civil Flying in the United Kingdom by April 30 (1919). They included rules for the registration of aircraft and the licensing of personnel, the certification of airworthiness for passenger aircraft and their periodic overhaul and examination, registration and nationality marks, log-books, prohibited areas, rules of the air, lights and signals, and customs regulations and other rules for aircraft arriving at and
departing from British Airports. Our work was made all the harder by the fact that these regulations were quite novel, and there were no precedents which we could follow."

4. Uneasy Progress

The years from 1919 to 1937 were marked by some remarkably perceptive thoughts and actions, coupled with a strong feeling in the manufacturing industry of being stifled and held back by the system of control implemented by government.

Attempts to consult industry there certainly were. For example, in late 1919 the Controller General of Civil Aviation wrote to the SBAC asking for the Society's views on the value of homing pigeons for civil aviation, as the RAF pigeon service was being disbanded. In the Society of British Aircraft Constructors' (SBAC) record of points discussed with the Controller General, it is recorded "The Society considers these are too expensive to be used in civil aviation. Effective wireless is preferred." It is perhaps surprising that the rejection was on cost grounds rather than those of speed and reliability.

It is clear from contemporary documents that much thought was being devoted to safety matters both within and outside the Air Ministry.

For example, in 1920 in his book "Aerial Transport" 3, Mr G Holt Thomas wrote:

"The argument that flying is inherently dangerous cannot in fact be substantiated. Just recently, since the Armistice, the Air Ministry's figures show that, for every fatal accident which takes place, more than 40,000 miles are flown in safety; and this figure is certain to be improved very greatly in the near future." He adds "It should be an elementary rule that those who fly do so without causing annoyance or risk to those remaining on the ground." Perhaps today there is a somewhat different view of the absolute numbers to strive for, but it is clear from this quotation that the concepts which are familiar today were in mind.

And again, in October 1922, Sir Sefton Brancker, who by then was Director of Civil Aviation, wrote "We have two immediate ends to attain in connection with navigation:

1. Eliminate engine trouble
2. Perfect the wireless.

Both are possible - and quite soon." 4

Somewhat optimistic, perhaps, but none the less forward looking.
By October 1925, Sir Sefton was able to present to the Royal Aeronautical Society an analysis of, as he put it "various sources of danger" together with some proposed solutions. He listed these as follows:

**Breakage of the aircraft itself in the air** - possible solutions - simplicity of design, vital members to be easily seen and easy of access, and concern was expressed about metal fatigue. Sir Sefton was convinced that all metal aeroplanes were essential, and that all too little was known about the fatigue of such structures.

**Jamming or failure of controls** - again simplicity of design was proposed, together with careful inspection. Sir Sefton noted that a regulation had been introduced prohibiting passengers from the cockpit, aimed at eliminating the risk of interference with the controls.

**Fire** - fireproof bulkheads were called for.

**Powerplant failure** - three engines were seen as desirable, because aircraft could not sustain flight if one of only two engines failed.

**Error of judgement** - the palliative to this problem, acknowledged as a major one, was to be two-fold - careful selection, good discipline and sound regulations on the one hand and, from 1st January 1926, carriage of two crew on all aircraft capable of carrying more than 10 passengers. The second man was to have, as his first duty, operation of the wireless. The question of provision of dual controls was unresolved, since many pilots objected, but the second crew member must be able to change places with the pilot easily. It was noted with regret that the comfort of the pilot and ease of handling had given way to demands for performance.

**Adverse weather** - it was envisaged that a reliable powerplant combined with efficient wireless navigation would eliminate the dangers of darkness and fog. The snow problem could be solved by the use of air intakes designed to prevent choking, and as to lightning, more study was needed.

**Collision** - rules were in place for clear weather, but as night flying increased, some form of automatic warning of the approach of another machine was needed.

The 1925 report from the Department of Civil Aviation adds to these points. Requirements for take off and landing had been formulated and were operative for landplanes. Experiments were proceeding from which it was hoped to derive stability and controllability requirements.

In the foregoing, the greatest emphasis is placed on the aircraft itself, and airworthiness seemed to be at the forefront of minds, even though it was recognised that operational matters, in particular pilot ability, played a large part in the safety level achieved. That is not to say that some operational regulations were put in
place. For example, it is noted in the 1927 report "In the event of bad weather conditions, and in particular in the case of very low clouds and fog a system of alternative routes for machines approaching and departing from Croydon has been put into force. This has been done to try and prevent any possibility of collision between aircraft caused by bad visibility."

However, on another front, there was less happiness with progress. In a comment in 1941, Mr T R Thomas, the first secretary of the Air Registration Board, wrote: "In the early days of Civil Aviation, suggestions were made that Civil Aviation would not develop to its full stature so long as it was subject to the strong influence of Service Aviation. Mr Handley Page had taken every opportunity of propagating the idea of a divorce of Civil and Service aviation, and it was mainly due to the influence of his efforts that an interdepartmental committee was set up in the late twenties under the chairmanship of J S Ross."

5. Devolution

By mentioning the Ross committee, we are taking the story somewhat ahead of itself.

Attempts had been made earlier to devise some degree of devolution of the task of controlling civil aviation. In 1920 Lloyds Register had set up an Aviation Department to provide a system of classification of aircraft and to compile a register of aircraft and pilots. The cost of this work was to be met by Lloyds, by subscriptions from insurance companies and by payments for copies of the register. In the event, the cost was not covered, and so the Treasury subsidised the work "up to a cost of £625". In January 1927, this work was dropped because of a lack of outside financial support. However, the work was carried forward by the British Corporation for Shipping which was approved to compile an International Register of Commercial Aircraft in the same month.

In November 1928, Sir Sefton Brancker wrote on the subject of devolution:

"Personally, I am anxious to see a start made along the lines proposed, for several reasons.

1. The increase in the number of British civil aircraft operating in the country and in other parts of the world will be considerable during the next two or three years.

2. I feel that Government control of civil aviation should be limited to the lowest measure possible, with due consideration to our International responsibilities and the safety of the public.

3. The history of shipping has proved that a policy on these lines is sound."

Clearly, then, at a senior level in the Civil Service, the idea of devolving control of at
least some aspects of civil aviation was welcomed.

By July 1929, the British Aviation Insurance Group (BAIG) had been given approval to deal with the general classification of aircraft, the inspection of light aircraft and recommendations for the renewal of certificates of airworthiness. But this approval was not extended to public transport aircraft. The British Corporation was given similar approval. This, however was not implemented by BAIG as Lloyds agreed to set up its own organisation. BAIG withdrew, and Lloyds was given approval in September 1929.

In 1930, both organisations applied to the Secretary of State for an extension to their role, and in a letter dated 14th August 1931, Lloyds spelled out their request as follows.

"_Inspection of all civil aircraft for renewal of Certificates of Airworthiness:

Inspection at Constructor's works of all aircraft and engines: Issue of Airworthiness Certificates

Approval of Design of civil type aircraft and engines and inspection during construction:

Approval of modifications for civil aircraft: Registration of civil aircraft:

Inspection of materials, equipment, aircraft and engines for foreign orders:

Supervision of ground engineers.""

This was a very ambitious shopping list which was not, in the event, devolved wholly from Government until the Civil Aviation Authority was formed in 1972. Hardly surprising, therefore, that the proposal did not get automatic acceptance.

In 1930 a committee had been established under the chairmanship of Air Commodore F V Holt (Director of Technical Development) "To enquire into the present difficulties experienced by British Aircraft Constructors in connection with the certification of aircraft for airworthiness, as affecting such Constructors' commercial interests, particularly in relation to foreign trade; and to make recommendations for the revision if necessary of the existing procedure and requirements." The membership of this committee included representatives of the SBAC and Imperial Airways. It had before it a lengthy and detailed submission from the SBAC drawing attention to the large number of different standards which an aircraft had to meet, and to the costly and complicated machinery needed to put them into operation. Also, "The Air Ministry lays down Requirements on matters regarding which there is little or no experience, thus suppressing initiative and retarding the development of civil aircraft."°
Many of the points made in the submission would doubtless find echoes today, though there would be unlikely to be complete agreement with them all. For example, "There appears to be confusion in the minds of Air Ministry Officials as to what constitutes airworthiness and what is a desirable commercial feature." The report then cites requirements for the strength of Safety Belts and Harnesses as an example. Today these are regarded as part of the airworthiness of the aircraft.

Nevertheless, the final report to the Secretary of State in February 1931 agreed that the present procedure did in some respects hamper aircraft firms in a manner which was sometimes detrimental to their commercial interests, and went on to make a number of recommendations aimed at simplifying and easing the procedures. In particular, it was recommended that it be recognised that the responsibility for the satisfactory design and construction of aircraft devolved upon the approved firms with a consequent reduction in the extent to which the Resident Technical Officer (RTO) need involve himself in detailed checking. The firm's report that the aircraft design and construction met requirements should be accepted.

There were other important recommendations, of which but two are selected.

Flying trials should be conducted at an official testing station or at the constructor's aerodrome, using the constructor's pilot for many of the tests.

The Civil Airworthiness Committee should be extended to include representatives of industry, SBAC, users and insurance interests to advise the Air Ministry on all matters affecting airworthiness regulations.

The Ross Committee was established to report on the policy of delegating duties connected with inspection of civil aircraft to one or more outside bodies. It comprised only officials as members, and its report was never published, though it is available today from the Public Records Office. The files contain much correspondence about the desirability of such a change, the associated problems and the costs. The committee made some sweeping suggestions, and such was the nature and complexity of the points which arose that it was decided to set up a further committee, drawing members from all interested parties, under the Chairmanship of Lord Gorell. The other members were Captain Harold Balfour, Mr E C Gordon England, Mr W Lindsay Everard, Lt.Col J T C Moore-Brabazon, Mr F Handley Page and Mr W A Workman. The committee was established in 1933, and its conclusions will be set out later in this section.

First, however, a short diversion. In the foregoing history, a reader might be excused for drawing two conclusions. Firstly, that it was the needs of the manufacturing industry which drove development, with the operational side barely getting mention, and secondly that experience of real operations was playing little part in helping to formulate either the regulations or the shape of the controlling machinery.
Such conclusions would not be entirely fair. Part of the difficulty stems from practice at the time. Reports of accidents, where they existed as separate documents, did not make recommendations as such, and we are left with somewhat generalised conclusions - as set out, for example, in Sir Sefton Brancker's paper, already discussed - to see the impact of accidents and incidents on regulation. In some cases, it is difficult to make a positive statement as to the influence an accident may have had. But before the Gorell Committee was formed, there had been the R 101 accident, and this was the subject of a detailed report. In its consideration of the events leading up to that accident, that report contains the following passage:

"It is clear that if those responsible had been entirely free to choose the time and the weather in which the R101 should start for the first flight ever undertaken by any airship to India, and if the only consideration governing their choice were considerations of meteorology and of preparation for the voyage, then the R101 would not have started when she did.

"It is impossible to avoid the conclusion that the R101 would not have started for India on the evening of October 4th if it had not been that reasons of public policy were considered as making it highly desirable for her to do so if she could.

"...it must always have been difficult for the distinguished officers at Cardington who sailed in the R101 to resist the strongly expressed urging of the Secretary of State...."

A report on a similar accident today would doubtless draw some recommendations from the foregoing. The report as published contents itself with the observations. It may have been, however, that the views of the Gorell Committee were coloured to some degree by the thought that there could be merit in separating safety and politics. If so, that may help to explain why the development of aviation regulation in the UK followed a path largely different from the rest of the world in moving responsibility away from the direct control of politicians.

Be that as it may, the Gorell Committee duly reported, and made a total of 18 recommendations, the majority of which were accepted by the Air Council. The report includes an interesting analysis of the causes of accidents to civil aircraft on the Air Ministry Register for the period 1926 - 1933 which sets the background against which the report was written.
### Table 3  Analysis of Accidents - Gorell Report

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Accidents</th>
<th>Per cent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>355</td>
<td>1926 - 1933</td>
</tr>
<tr>
<td>Category A</td>
<td>258</td>
<td>Cases in which no part of aircraft or power-plant was in any way at fault</td>
</tr>
<tr>
<td>Category B</td>
<td>60</td>
<td>Cases in which engine failure occurred taking-off or in flight, including shortage of fuel in tank, misuse of engine controls, etc</td>
</tr>
<tr>
<td>Category C</td>
<td>23</td>
<td>Cases in which the aircraft was, or became, defective in flight for any reason apart from power-plant failure. Cases of structural failure, faulty control gear, fire in air, etc</td>
</tr>
<tr>
<td>Category D</td>
<td>15</td>
<td>Cases of exceptional nature or indeterminable</td>
</tr>
</tbody>
</table>

#### Category A

258 Accidents, or 72.3 per cent of total number

(a) 177 Errors of airmanship alone, including possible cases of pilot's physical disability
(b) 20 Bad weather conditions
(c) 38 Collision with other aircraft, overhead cables, telegraph wires, trees, buildings, etc., in conditions of reasonably good visibility
(d) 16 Use of unsuitable aerodromes and landings on bad ground
(e) 7 Interference with dual controls by passengers, either accidental or intentional

#### Category B

60 accidents, or 16.9 per cent of total number

(a) 29 Engine failure followed by errors of airmanship
(b) 31 Engine failure in circumstances likely to lead to accident

#### Category C

22 accidents, or 6.1 per cent of total number

(a) 9 Structural failure of aircraft
(b) 2 Unsatisfactory aerodynamic qualities of machine
(c) 9 Defective aero-controls
(d) 2 Outbreak of fire in the air

Although the detail differs, possibly in part at least because of the particular categories used, the overall conclusion is not so different to that shown by analysis of today's accidents - that is, the majority are due to causes other than airworthiness. The Gorell Committee noted this in one of its conclusions:

"Entirely wrong values have been placed upon the relative importance of the pilot,"
the machine and operational activities, in arriving at the regulations to be imposed. The failure of the pilot is by far the most potential source of accidents in flying."

It is somewhat surprising, therefore, that the Committee made no significant recommendations on the subject of operational controls, which would have been within their terms of reference. They made a number of recommendations on the need for certificates of airworthiness in certain cases, recommended that third party insurance should be compulsory, advised that towed gliders and gliders carrying passengers for hire and reward should hold certificates of airworthiness and that their pilots should be licensed, considered that it was inappropriate to attempt to impose restrictions on Sunday flying, and recommended that the control of airworthiness of civil aircraft should be devolved to a statutory autonomous Board to be formed from the Joint Aviation Advisory Committee of Lloyd's Register and the British Corporation Register. In making this last recommendation - suggesting that the new Board should be called the Air Registration Board - the Committee also recommended that the Board should receive an annual grant to cover part of its costs in the early years of its work but that it should aim to become self-supporting.

The Committee in its report made two observations of particular interest. They said "We agree with the pronouncement in the Ross Committee report that 'the policy of control of private flying . . . cannot be settled in isolation; the future control of civil aviation in respect of all airworthiness matters must be considered as a whole." In another remark, they said "We feel there is substance in the representations of the SBAC and others . . " and after listing the various grievances go on to say "without the good relations which exist between Air Ministry officials and firms, aircraft construction in present conditions would be almost impossible”.

The various recommendations were largely accepted, but in the event, the two Shipping Registers which formed the JAAC declined to participate, on the grounds that unless control remained in their hands, they would not be justified in using their resources to develop aircraft classification. This, of course, made it impossible to implement the Gorell recommendation in the terms in which it was written, but a further Committee was set up under the chairmanship of Mr Handley Page (later Sir Frederick) for the purpose of drafting a scheme. The outcome of this was a blueprint for the Air Registration Board, and the ARB which came into operation in February 1937 followed the proposed pattern very closely.

As already remarked up to this time relatively little attention appears to have been paid to operational matters, even though, as stated by the Gorell Committee, these gave rise to the major proportion of accidents. Mr Alec O'Connor has previously pointed out\(^{11}\) that the situation was very different in the USA, where a recognition of the need for better regulation of the operational side occurred much earlier than here.
There were, however, steps along the road, some already touched upon. In 1926, the Under Secretary of State met the Royal Aero Club, the SBAC, insurers and others to discuss proposals for the relaxation of regulations governing private flying. Interestingly, Mr Handley Page, who usually appeared on behalf of the SBAC attended this meeting as a representative of the Royal Aero Club. There was a strong plea for a complete relaxation of the controls on private flying, and a suggestion that the medical examination could be replaced by a certificate from the applicant's own doctor that he was fit to fly. Some felt that the pilot licencing requirements could be greatly simplified.

A major report of the period was that of the Maybury Committee in 1936. This Committee recommended\textsuperscript{\textsuperscript{12}} a number of organizational changes, including one that radio facilities, a meteorological organization and a comprehensive air traffic control organization adequate to secure the safety and regularity of air communications should be provided, maintained and operated by the Government without cost to aerodrome proprietors. The Committee suggested that a route network should be established which they called the Junction Aerodrome system to avoid indiscriminate multiplication of services. They noted that independent routes joining major centres in the UK would have a route mileage of about 2900, whereas if aircraft from all these centres flew to a common point, where the passengers presumably changed onto another service to their ultimate destination, the mileage could be reduced to 960. The concept was derided at the time. Today it might be recognised as an early expression of the 'hub and spoke' concept, though the idea of flights between this and other hubs had not yet emerged.

The Maybury Committee also recommended that aerodrome proprietors should be responsible for providing the necessary equipment, other than radio, to enable their aerodromes to be used in safety in all conditions of visibility. They further considered that the pilots of companies engaged in air transportation should be subject to special tests of skill.

One further pre-WWII committee must be mentioned, the Rae Committee, charged with enquiring into the working of the Directorate of Operational Services and Intelligence in the Department of Civil Aviation. This Committee, in 1938, looked into complaints about staffing in the Operational area, and recommended a clear division between operations and other areas. Also, Gorell, in a 1939 report, recommended the introduction of a student pilot's licence.

Before leaving the pre-war years, there must be a comment on medical control. We have already seen that medical standards for commercial pilots had been introduced by 1919. In fact, CAP 1 was entitled "The medical examination of Civil Pilots, Navigators and Engineers". Medical examinations for "A" licence holders were introduced in 1924.

The controlling organisation within the Air Ministry, the Central Medical Board, had a long history. However, as mentioned earlier, by 1926 there were views that
standards were inappropriate, at least for private pilots. By 1938 the standards for commercial pilots had grown very stringent. Today airline pilots are able to go on in defined circumstances to the age of 65. In 1938 the limit for a commercial pilot was 45, and some of the tests, such as placing the candidate on a rotating chair to test reaction to aerobatic or stunt flying, have been either dropped as irrelevant or replaced by others considered more appropriate.

6. World War II

Civil aviation of course took a back seat during the early war years, but Lamplugh (1943 and 1944) made a number of sweeping suggestions. He introduced the concept of an international governmental authority and advised that civil aviation be transferred to a Ministry of Transport or of Civil Aviation. There was also the Brabazon report which dealt with the future civil fleet needs, and from which flowed such aircraft as the Dove, the Marathon and, of course, the Brabazon itself. The Hildred report of 1944 reviewed the recommendations of the Maybury report in the light of developments.

A report in Flight dated 19th October 1944 gives a valuable contemporary view of the developing scene. Reporting the appointment of Lord Swinton to the newly created post of Minister of Civil Aviation, the report also refers to a conference in Montreal which was concerned with Empire Air Routes, and to the forthcoming conference in Chicago at which international organisation was to be discussed. At the time of this report, though there was a Minister, there was no Ministry of Civil Aviation, and responsibility continued to rest with the Secretary of State for Air. However, it was made clear in a debate in the Lords that there should be an independent ministry. Subsequently Lord Beaverbrook outlined British Government policy, which was that international regulation should be imposed on civil aviation, controlled by an international authority which, it was envisaged, would lay down international standards.

7. The Post-war Period

An important development in the postwar period was the emergence of a more comprehensive international arrangement than had existed previously. As we just noted, a conference was held in Chicago as a result of which the UK agreed tentatively to the formulation of international requirements. The Provisional International Civil Aviation Organisation (PICAO) met for the first time in Montreal in February 1946 with the object of considering proposals for a code of airworthiness which would be internationally acceptable. The UK delegation was led by Lord Brabazon. At this meeting, a fundamental difference of view between the American and British delegations appeared. The American delegation preferred a long and detailed code based on the then existing American code. The British delegation, fearful that this code would be too rigid for the new types of
aircraft, including jets, which were on the horizon, and with the backing of the SBAC, felt that it would be better to adopt a shorter and more general code, supplemented by a number of recommended practices, until the general code could be expanded into a more detailed one as and when experience became available. Most of the rest of the members were prepared to adopt the American position, but the outcome was the adoption of a relatively detailed code in sufficiently general terms to allow each national authority to exercise considerable discretion whilst maintaining the common minimum standard.

Thus were laid the differences in approach between UK standards and US standards which bedevilled industry for so many years. It is not possible to say who was right and who was wrong. The fact is that the situation has changed considerable over the years. In 1945 the main preoccupation of the UK manufacturing industry, perhaps with their pre-war experiences in mind, was to avoid being inhibited in design by restrictive regulations. More recently, a major concern has been to ensure that aircraft can be sold with minimum change to the widest possible range of countries, many of which have used US rather than UK standards. Moreover, the influence of operators on the shape of regulation appears to have been relatively weak in the immediate postwar years. Today they wish to be able to buy aircraft from anywhere and put them on the appropriate register with as little change as possible.

Other factors were also relevant. In the UK an aircraft could be issued with a certificate of airworthiness if it could be shown to be “fit to fly”. The British Civil Airworthiness Requirements simply constituted a means by which that might be shown. They therefore had no legal standing. By contrast, in the US the airworthiness requirements were enshrined in law, and an aircraft was entitled to a certificate when it had been shown to comply with them. Only if the Aviation Authority could show that the law was inadequate or inappropriate in the particular case could any changed or additional requirement be imposed.

At the end of the war, the responsibilities for civil aviation in the UK became fragmented, with the Ministry of Civil Aviation and the Ministry of Aircraft Production, as well as the Air Registration Board each having a particular role. Many changes in controlling Department (Transport, Civil Aviation, etc) occurred over the years up to the formation of the Civil Aviation Authority in 1972. There was, however, considerable stability in staff, even though the Ministry, Department or Board which sheltered them changed. And, of course, the ARB continued throughout this period.

Committees continued to consider the needs of British civil aviation, sometimes discussing structure, sometimes more technical matters: For example, the Helmore Committee (on Certification of Civil Aircraft and approval of equipment) reported in 1949\(^{13}\). One of its findings was that certification flight trials did not take account of the conditions in which an aircraft might have to be operated, and it recommended that trials should include intense endurance flying if the aircraft or powerplant was unconventional or incorporated
new design features. This flying was to be carried out in conditions as close to operational ones as practicable, and should be aimed at testing reliability during the early period when defects were likely to arise. This recommendation was accepted by the Government, and the ARB undertook to apply such a requirement. Thus yet another UK difference arose, for whilst the US regulators had similar concerns, they went about addressing them in a different way.

Accidents, regrettably, continued to happen. The Shelmerdine Committee, which reported early in 1945, examined the question of the need to alter the accident investigation regulations. An interesting conclusion was that consideration should be given to the question of furnishing to aircraft constructors and operators technical information obtained in the course of investigating accidents. The committee also considered that States should be involved in the investigation of accidents which happened abroad to aircraft on their register. Both of these points are taken for granted today, and it would be difficult to envisage a situation where they were not applied.

During this period, also, accidents started to have a more direct feedback into regulation than can be traced during the pre-war period. The accident to a Viking at Southall led to the introduction in the UK of the concept of the Air Operator's Certificate. A degree of supervision of public transport operations had been initiated in 1948 but these had taken a somewhat simple form. They consisted of pre-flight inspections by aerodrome staff who did not necessarily have any operational training or background. The AOC was a much more developed concept which aimed to ensure that the operator was both competent and properly staffed and equipped, and the regulatory authority employed operationally competent people both to check before the AOC was granted and to supervise its continued validity.

A Comet accident following a ground stall after rotation led to the idea of take-off abuse testing, and of course the two Comets which crashed in the Mediterranean led to much more rigorous treatment of fatigue issues, though concern about these had been noted many years previously by Sir Sefton Brancker.

Sometimes it required more than one accident to cause the regulations to mature. For example, the report of the Court investigation of the accident to a Tudor aircraft, Star Tiger, in January 1948 contains the following observation: "An important contribution to safety in the air is provided if arrangements are made for a careful examination of any incidents or minor accidents which may occur, in order to eliminate their causes and to warn the crew of aircraft of the circumstances in which they arise. On the evidence produced at the Inquiry, the Court has formed the opinion that no such organisation existed in the British South African Airways Corporation, or, if one did exist, it was ineffective.” Post this event, most British airlines did establish some system for looking into incidents, as did the regulatory authorities, but it was not until after the accident to the Trident at Staines in 1972 that a coherent and statutory system was finally put into place in the UK.
8. The role of Concorde

Concorde was the trigger for far-reaching developments in two ways. Firstly, it was a joint project between the UK and France. Secondly, it was an aircraft full of novel features. Because of this, coupled with the fact that the two countries did not have a common airworthiness code, it was decided that a set of standards should be produced appropriate to the aircraft. The development and application of those standards have been described elsewhere\textsuperscript{17,18,19}. For the purposes of the present paper it was the impetus given to the decision to produce a common set of standards for aircraft manufactured in Europe which is particularly significant.

A great deal of effort was expended, both by the authorities and by the aircraft manufacturers, in preparing and applying the Concorde standards. Because of the legal situation in both countries it was necessary for each country, in order to comply with ICAO standards, to issue a certificate in such a way that both countries had done sufficient work to be able to state that they were, of their own knowledge, fully satisfied as to the airworthiness of the type. This imposed a considerable burden on the manufacturers as well as on the authorities and it was then relatively easy to agree that, for any future joint projects a better way had to be found. Discussions between authorities and manufacturers led to an agreement to produce a common code, to be known as the Joint Airworthiness Requirements which, it was intended, would be adopted by all signatory countries.

9. Formation of the UK Civil Aviation Authority

At this point it must be recognised that there were simultaneous developments in, on the one hand, the regulatory framework within the UK, and on the other the move towards some form of European co-operation.

In 1969, Edwards reported on British air transport in the Seventies\textsuperscript{20}. The report included a number of recommendations relating to the operating industry, but its importance to safety regulation was contained in its recommendations concerning the establishment of an Authority, separate from any Government Department, but comprised of members appointed by the Secretary of State whose tasks would embrace:

- the economic regulation of route licensing
- the control of air traffic
- and the regulation of safety.

It was Edwards' view that it was necessary, in the future, to bring all safety regulation under one control - both operations and airworthiness. Specifically, the Authority should be responsible for the economic and safety regulation functions then dispersed between the ATLB (Air Transport Licensing Board), the Board of
Trade and the ARB. It should also be responsible for the civil side of the joint National Air Traffic Services, for operational research, for long term airport planning and for the main work of traffic rights negotiations. The new Civil Aviation Authority came into being in April 1972. An important part of the Act which established the CAA also established a statutory body, the Airworthiness Requirements Board, which the CAA was charged with consulting on matters relating to airworthiness standards, and as to whether or not aircraft met those standards.


It soon became clear that there was considerable enthusiasm for this concept, though many problems lay ahead. In order to issue a certificate of airworthiness recognized by ICAO and giving automatic overflying and landing rights to an aircraft without the State of overflying or landing needing to do its own investigation into the safety of the aircraft, its certificate of airworthiness had to be issued on the basis of compliance with a “detailed and comprehensive national code”.

The European states most interested in pursuing this project were those with an aircraft manufacturing industry, though all countries were welcome to become involved. There were already a number of pan-European aviation groups and these were all informed and many of them became involved in various ways.

There were a number of tasks to be performed. The standards to be covered by the agreements had to be defined. Those relating to large public transport aircraft and their engines were obvious for inclusion, and in fact were the first to be addressed. Also important were the standards for helicopters. Light aircraft and gliders were not included in the first tranche of work.

A secretariat was set up, initially in the UK, to service the effort and to record its results. Over the years many countries decided to join the JAA arrangements and by 2004 they were Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK. A number of other countries, mainly Eastern European, were candidate members.

Eventually the JAA (Joint Airworthiness Authority) Secretariat moved to Hoofdorp as its work expanded to embrace, for example, licensing and other operational matters. It was managed by a board consisting of one senior member from each member Aviation Administration. The day to day management was overseen by a JAA Committee, which consisted of one representative of each National Aviation Authority and an Executive Board consisting of six members drawn from the Committee. The Joint Airworthiness Authority was renamed the Joint Aviation Authority in 1993 when its responsibilities were expanded to cover some operational matters.
It will be noted that not all members of JAA were members of the European Community. Thus, when the EC decided that it wished to establish a European Aviation Safety Agency, it was necessary to make arrangements to safeguard the interests of the non-EC members. This was done initially by EASA becoming a de facto member of JAA. Eventually, however, EASA became an active organisation in its own right and effectively took over the work of JAA.

It is important to note that, in seeking to devise a common code, the various authorities involved had to review their own standards. Many of the participating States were using a national code heavily based on the code of the United States. The UK was the major exception, having its own BCAR (British Civil Airworthiness Requirements) code. The UK had worked for many years with the US with the objective of reducing the differences and progress had been made. Nevertheless many differences remained. Other States, even though they might use the US code as a basis, also had differences following their own aviation history, particularly as influenced by accidents. To enable progress to be made it was agreed that any State could deviate from the basic JAR (Joint Airworthiness Requirements) standard by declaring a National Variant, although in the first instance an attempt should be made to persuade the other participants to agree to that particular standard. The National Variants, clearly identified, were published as part of the JAR documentation, so that it was clear what was required. The objective was, with time and by further study, to reduce the number of National Variants to zero. However, whilst it is relatively easy to introduce a new requirement following an accident, it is much more difficult to remove it in the future, since if that be done without comprehensive evidence, a further accident would leave the authority in question very exposed.

11. The formation of the European Aviation Safety Agency

The JAA having been formed and apparently doing a successful job it may be asked why there was a need for another body. Apart from any views of the Commission there were pressures from industry for such a development. The weakness of the JAA arrangement was that it was just that – an arrangement. There was no treaty supporting it though several attempts had been made to produce such a treaty. AECMA (European Association of Aerospace Industries) in particular perceived it as beneficial to have a legally binding arrangement throughout Europe which meant a single certification process to a single set of standards. Operators also saw benefits in that national variations of standards would no longer be allowed. Even though progress had been made in reducing the number of differences in airworthiness standards differences remained in operational standards many of which affected the build of the aircraft. These could be as apparently simple as labels but could be costly to change if an aircraft went from one State of Registry to another.
However, to replace the existing national authorities, only part of whose work dealt with such matters as certification, with a supra-national authority would have been an enormous task of doubtful value, and would have resulted in a very large and costly organisation.

The decision was therefore taken to leave the national authorities in place to continue with much of the work involved in the supervision of aviation and the issue of certificates of airworthiness to individual aircraft, whilst the EASA addressed matters such as type certification and standards. Processes were put in place to monitor the work of the national authorities to ensure that standards were applied evenhandedly. EASA commenced operation in 2003 and by 2011 had a staff of about 500.

There were perceived to be dangers in the resulting division of duties which raised the risk that an important matter could fall between the two bodies (EASA and a National Authority) with each assuming that the other would deal with it. Procedures have been put in place to minimise this risk.

EASA now sets out its organisation structure in the following terms:

“In order to ensure that decisions on safety issues are free from all political interference decisions must be in the hands of a neutral and independent decision maker invested with the necessary power. This is why the safety decisions of the agency will be taken by its Executive Director as is already the in most countries which have developed systems for aviation safety regulation.

Since these decisions directly affect people and organisations, the Regulation creates an independent Board of Appeal whose role is to check that the Executive Director has correctly applied European legislation in this field.

The Executive Director is appointed by the Agency’s Management Board.”

This Board is formed from representatives of the Member States and the Commission.

“The EASA Advisory Board assists the Management Board in its work. It comprises organisations representing aviation personnel, manufacturers, commercial and general aviation operators, maintenance industry, training organisations and air sports.”

Some echoes of the pre-EASA UK arrangements will be detected, though time will be needed for the system to mature.

As to the standards themselves, EASA adopted the work of JAA, and to a degree
the standards can perhaps be regarded as relatively mature, at least in their broad thrust. However, new designs of aircraft (such as those, for example, heavily utilising composite structures) will always require the standards to be reviewed for appropriateness and relevance. Similarly new types of operation may call into question the adequacy of existing regulation - the development of extended range operation with twin engined aircraft some years ago was such a case.

Attempts to minimize differences between standards – for example, between Europe and the USA - will no doubt continue.

12. Conclusion

In this review of 100 years of aviation safety regulation in the UK the early development of standards has been described and the evolution of the controlling agencies has been followed.

It has been shown how the standards moved from being concerned with the safety of those on the ground to a realisation that the airworthiness of the aircraft should be regulated and then that regulation of operating standards was necessary.

The part played by accidents in improving the standards has been described.

The problems posed by the way in which the industry was monitored in the early days of aviation have been set out, together with the steps taken to alleviate those problems.

As the manufacture and operation of aircraft has become more international in scope further problems arose, and resulting emergence of a European Authority has been briefly described.

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