

**THE PRESIDENTIAL ADDRESS**

of

A. W. Davis, D.Sc., C.Eng., F.I.Mar.E.

Read on 1st October 1974, at the Great Eastern Hotel, London, EC2



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Dr. A. W. Davis, C.Eng., F.I.Mar.E., was educated at Glasgow Academy and Glasgow University, where he graduated as a B.Sc. with First Class Honours in Mechanical Engineering in 1933. He obtained a D.Sc. degree in Engineering for contributions to marine engineering design, development and manufacture of gears for marine applications. He is the author of many technical papers, and has been the recipient of bronze and gold medals from the Institution of Engineers and Shipbuilders in Scotland, the James Medal from the North East Coast Institution of Engineers and Shipbuilders, and the Denny Gold Medal of the Institute of Marine Engineers on two occasions.

He also presented a Thomas Lowe Gray Memorial Lecture, was a Clayton prize winner at the Institution of Mechanical Engineers and gave the Andrew Laing Lecture to the North East Coast Institution in 1961.

Serving his apprenticeship with the Fairfield Shipbuilding and Engineering Co. in Glasgow he remained with the company until its liquidation 36 years later. After being Chief Designer and then Engineering Manager, he became Deputy Managing Director, which post he held for 15 years until 1963.

For five years he was Marine Mechanical Manager with Westinghouse Electric in California and he is now Technical Director for their Marine Turbine Division in Europe.

Dr. Davis has a long record of service to the Institute. He is a former Member of Council and Vice-President, and has served on the committee of the Scottish Branch. He was a member of the National War Memorial Appeal committee, and was Chairman of the California Branch of the Institute in 1969, being one of the founder members of the Branch. In 1970, Dr. Davis was elected a Vice-President of the Institute. He has been Chairman of the Finance and General Purposes committee; has served on the Papers and Technical committee (this has now become the Technical committee) and is a past member of the Development committee. Dr. Davis is at present Chairman of the President's committee, Chairman of the Maritime and CEI Policy committee and Institute representative on the CEI Board. He is also Chairman of the Office Bearers Nomination committee. In 1973 Dr. Davis was Deputy President of the Institute.



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It is a very real honour to be elected President of this Institute and one which I deeply appreciate. Under the new By-Laws, the President really has to work his passage, but this keeps him more closely in touch with the day-to-day working of the Institute as in fact was the intention of the Council in making this particular alteration. It certainly adds greatly to the interest of the duties.

I should take this opportunity of repeating what you must already know, that the freedom we once held of qualifying members as our Council saw fit on the recommendations of the Membership Committee has now passed in large measure to the Council of Engineering Institutions. This, nationally is a desirable development, but it does mean that our President of the day must be very much alive to current circumstances lest we find we are committed to further entanglements beyond our desires.

Every organization has to face serious financial problems in these days of superinflation and I believe it to be advantageous that the President should become directly involved in many of the detailed decisions that have to be made. The fact that we are not in our building tonight is a consequence of one of the most important decisions your Council has had to make in recent years, namely that the Memorial Building should not only be modified so as better to meet requirements changed, as the years have passed, but, more important, that by bisecting our lecture theatre horizontally we are able to let a floor at current rents that will significantly improve our financial position. By a process of juggling with space which it is inappropriate to detail tonight, this benefit will commence to accrue to us in large measure this very month, although the building was only closed for the duration of alterations as from August.

In this connexion an apology is due to all our members for the fact that so little warning was given of the temporary closure. The apology would not have been necessary but for a printer's strike affecting a recent issue of our *Marine Engineers Review*.

It is conventional for the main purport of the President's address to be less parochial than the comments I have just made, and I would like to speak on some aspects of Compromise in Engineering which to me have taken on a new significance after recently spending five years in American management. I refer to the British understanding of the word Engineering rather than the narrower American interpretation of the word.

The dictionary describes Compromise as "a settlement of differences; an adjustment of one's theories or principles". I find this an acceptable description of what I mean to say, provided you do not consider it as applying against a background of conflict—and here I would interject that I am not extending Engineering so far as to cover labour relations, although some of my comments may be applicable to that subject and perhaps more topical than was intended. Compromise must of course be as between a and b and not between a and 2b or whatever number of b's are required to make the compromise equal b.

After 25 years in management in this country, I found myself in California with duties to perform almost identical to those that had filled my life here for 15 years, except that I was severed from any connexion whatever with the diesel engine; I did not find the separation altogether distasteful. Otherwise the mechanical side of life was virtually identical. People's reactions tended to be rather different, and not because I was a foreigner—never was I made to feel more at home. Systems were vastly different, to the extent that in

one area of my activities I had, in the first year, a file headed "Financial Confusion". This obstacle was largely overcome by an abundance of goodwill from the financial controller and his staff who understood my difficulties. In the purely engineering world life was made easier by the fact that they use a system of measurement I have understood from my early days.

If one plays an organ solo one can afford to be—and indeed for success must be—an individualist. However, the moment one enters into an activity with anyone else in any capacity, the efforts of the two must be co-ordinated to be a success. The establishment of this co-ordination in its early stages must mean a degree of compromise by both parties, perhaps even unknowingly. But once established, that co-ordination bears no evidence of compromise unless it is chosen as a subject of study through a process of analytical disintegration. The multiple application of compromise in the progressive establishment of, say, a design and manufacturing enterprise leads to a recognized code of procedure. If alteration is required, it can only be achieved successfully by intensive preplanning, communication and training. I am not concerned here with alteration, but with differences as between one company and another, or one country and another. When I first met with these differences, I used to wonder whether they were principally peculiar to the company or the country. Every time I had the opportunity to check, I found the point of issue to be a countrywide characteristic. This may be a reflection of training college practices tending to be uniform within any one country, and the continual interchange of personnel between one company and another in any one country over many decades. The consequences are no doubt taken more for granted as between country and country when the language is not common. In the most formative years of industry, coming and going between this country and America was extremely limited and the kind of differences I am discussing can be set down on paper, but are not at all easily absorbed in practice. I suggest this is why American business consultants are often less effective over here than would be hoped; it is not just a question of saying—Do it this way or that—it is almost no exaggeration to say that if change is desirable, one tradition has to be broken and another developed, which takes time and determination on a wide front.

I am going to speak of a few of these differences as I saw them in the order in which the product is produced.

In the US, design is more specialized. You will probably find someone who knows more about any particular speciality than anyone you ever knew. The problem of design is aggravated by the need to co-ordinate all this knowledge. It means frequent meetings of groups of people on a scale strange to British eyes and it takes longer to produce a design in consequence, but the chances are it will be a better design. A part of the function of management is to ensure that progress is being made at these meetings and that they do not devolve into a "buckpassing session".

The designer responsible (cognisant engineer) remains in control of the design right through the drawing phase and the chief draughtsman is only responsible for drawing methods, completion schedules and staff. If the drawing ultimately bears a fault, even in summation of dimensions, it is the responsibility of the cognisant engineer. The chief draughtsman is not even categorised as an Engineer and is often known as the Drafting Manager. But the designer must never use a T-square or its equivalent. It is all very costly and slow, but no disputes arise such as may sometimes



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be seen in this country between chief designer and chief draughtsman, between whom the demarcation of responsibility is often difficult to define.

Before commenting further on the relative quality of finished drawings, I must make mention of one of the most effective factors in their production.

Undoubtedly stemming from the automobile industry is quite a large force of men known as Manufacturing Engineers. They are most closely related to Industrial Engineers as employed in this country, principally in the mass production industries. Put simply, the duties of these people as a group are:

- 1) to examine drawings in process of preparation and ensure they are suited to most economical manufacture and that dimensioning is suited to numerical control where necessary;
- 2) to accept responsibility for this by one of their number signing each finished drawing.
- 3) to design, draw down and arrange for the manufacture, selection or purchase of all jigs, gauges and tools required;
- 4) to prepare manufacturing information documents;
- 5) to advise machine shop foremen about the setting up of work on machines, feeds and speeds;
- 6) in the case of numerically controlled machines to prepare and check tapes.

From this it will be realized that a finished drawing, apart from defining materials and dimensions, portrays a far greater wealth of know-how backed by individuals carrying responsibility than is customary in this country.

It also follows that the time taken and cost involved makes multiple manufacture an economic necessity. Also any alteration, either for the sake of improvement or to correct error, is a relatively costly embarrassment.

In my recollection of marine practice in this country, it was only by almost casual observation that special machine shop requirements found their way onto the drawings, and the rest of the Manufacturing Engineers' duties were the responsibility of busy Shop Superintendents.

There has been a wealth of compromise in the past that has given the American Manufacturing Engineer so much authority in the drawing office.

The import of Quality Control reached marine engineering in this country many years ago, but I still recall the reluctance of foremen to accept that their work should be checked—they were not prepared to compromise by giving away this part of their responsibility.

Sandwiched between Manufacturing Engineers and Quality Control Inspectors, the American machine shop foreman does not have a lot to do with the product, but he does have time to manage his shop, or at least those functions not managed for him by Production Control. When anything goes wrong he can afford to spend time restoring matters without finding the rest of the shop has come to a standstill.

I believe the import of Measured Daywork has now been recognized in this country, if not always practised. Operated properly it becomes a measure of the efficiency of the foreman. Its adoption has been made possible by compromise on a broad front, and my personal observation is that the rate of output per man on the shop floor is more than double my previous experience with piece work. This increase arises from the management contributions already touched upon and from a real urge to work, which was refreshing. The foreman spent virtually no time on disputes—any incipient dispute was immediately turned over to people trained in the subject—another case of compromise, this time resulting in some diminution of the Works Manager's responsibility.

American methods of Production Control have been well absorbed into this country in one form or another and call for no comparative comment. They of course depend upon shop floor management having compromised in releasing

their grasp upon what might have been regarded at one time as the mainstay of their lives.

The erection shop saw the greatest likeness to British practice except in name. Little fitting was necessary because of accuracy in machining and correctness of drawings. The operatives were a cheerful crowd of men and the superintendent always had a smile for me when I passed by.

The product now being complete and beautifully protected for despatch, I would like to look briefly at differences in costing practices. Let me say first that I have experienced the ultimate consequences of inadequate financial control and it would ill become me to criticise a form of control that is somewhat overwhelming, but I did not observe much that I could describe as having evolved through compromise.

It seemed at first like a game of chance to assume what orders are going to be received 18 months hence, and yet this is a necessary step in establishing a proper cost objective for the following year. Three months after the year has started, the objective has to be corrected by a forecast and this is repeated every month thereafter to prevent any sudden surprises, and usually ensures that necessary corrective actions can be taken in time at a high management level.

This, in its more complicated application, is almost exactly the same as the system adopted in operating this Institute's finances, and I think we are fortunate in having been so wisely guided in this vital matter. Going beyond the basically simple concept, great complications can arise in industry in the breaking down of component costs, the handling of costs of advanced or delayed work, and of costs as between one department and another, and it is not intended to comment further on these details.

The requirements of the estimator always have to be borne in mind and here a great difference showed up as between what I will call British and American practices as applied to marine engineering. Over here the Chief Estimator is a man of considerable authority. He uses the man-hour and material cost details provided to him over the years, duly corrects the latter for price levels, relates then to the design and thereby develops his own data. When requirements arise he can quite quickly provide a reliable estimate to which top management applies the charges and profit thought appropriate. In America each department provides its own estimates of man-hours. The estimator who often is responsible to the Works Manager collates these figures, applies the current costing rate for each department, adds his own estimated cost of material and an assumed profit rate after which the Sales Manager handles the subject as he sees fit in conjunction with the General Manager. Thus the manufacturing departments really establish their own budgets. In this case, it is in this country that there has been a greater application of compromise in the system used, because the department managers have in effect put their future well-being in the hands of the Chief Estimator. It is a process that tends to produce a more competitive price, but is more difficult to use effectively in subsequently co-ordinating progressive total man-hours per department with budgeted estimates. The case can be argued both ways and the conclusions might well be found to favour one system in one category of production and *vice versa*.

In more general terms it might be said that it should be the principal attribute of a manager to be correct in his decisions. If he is too smart at his job, the growing knowledge of the probability of his decisions being correct makes him autocratic, which reduces his usefulness and makes it very difficult to replace him when the time comes. A wiser manager tends to listen more to his advisers and to compromise with their views in forming decisions. In my experience, the latter type of manager is more prevalent in the United States than in this country and I have little doubt that this is not inborn, but is developed by his greater exposure to co-operative decision making in his junior years.

In the realm of communications with the work force, I have seen compromise with commercial security through the medium of works magazines to a degree that would not



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be seen in this country. This was the result of more careful thought in making a distinction between what really did, or did not, constitute commercial security, this being in contrast to the simple attitude "that is none of their business". I thought this to be very healthy and it did much to encourage the team spirit.

In making these comparisons of British and American marine turbine design and manufacturing practices, portrayed in their differences as being the consequences of different degrees of compromise over decades, I have made no attempt to suggest that either is superior to the other, although in certain examples my own views tend to shine through. If they do so, it may be misleading, because each practice operates against so different a background that the success of any particular practice is for the most part very dependent upon that background. I have already hinted at the dangers of assuming that a transplant of practice from one country to the other can be successful unless carried out with great circumspection and with a deep study of the effects of doing so in a different environment. To affect a change in this country is particularly difficult against the background of conservatism which is no less a way of life among the workers than the managers.

This is not a proclamation of despair that we may ever improve our methods but indeed a word of encourage-

ment to do so, only, however, with the most carefully prepared plans in which advanced communications should play a dominant part and compromise must be an acceptable facet of that plan.

In the non-organic world of design good compromise is the very essence of good design, and the facts involved are the same the world over, though ever more complex as time passes.

It still must be the principal function of our Institute to try to ensure that as many of our members as possible are fed with such facts as we can disseminate, and in the most digestible form that can be understood and remembered or usefully filed away for *immediate* reference. In four manners we seek to meet these requirements, firstly by our technical meetings in London and the Branches, supplemented by the *Transactions* with discussions for the more specialized subjects; secondly by conferences at which a group of papers on a specialized subject is presented and discussed, the proceedings subsequently being purchasable as bound volumes; thirdly by the *Marine Engineers Review* which I believe is being received with increasing satisfaction by our members; and fourthly by our books on selected subjects. I would wish to encourage everyone involved in their authorship and production to handle the whole activity with the dedication it so urgently requires.