The Oxford 'A' level examination in Design

An interim appraisal of an experimental approach.

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The first examination of this syllabus to be held has just taken place so that an interim appraisal is possible.

The intention of the sponsors was to establish an A level course in which practical work within a design framework was used as a means of identifying intellectual ability and original thinking. It was essential to avoid 'soft option' and hence the standards of assessing are vital to success. Since the very nature of the course calls for just those qualities that are least easily identified, let alone assessed, this is no easy task.

Having got the syllabus accepted and the schools ready to introduce courses in it, Malcolm Deere, on the recommendation of the sponsors, was appointed examiner. He had previously had considerable experience of assessing design project work at undergraduate level and has since put in a great deal of effort in organising methods that seek to reflect the intention of the syllabus. Not only has a lot of time been spent on personal interviews for assessment purposes, but a close watch has been kept on the work throughout the course so that, by the time the assessment took place, an understanding between student and examiner could exist. Although if numbers are later to increase this sort of close scrutiny may no longer be possible, it is essential in the trial period and everyone connected with the syllabus is grateful for what has been done.

The assessment consists of two written papers of three hours duration. Paper I deals with the sections of the syllabus entitled, 'Man as an individual', and 'Man in society' and Paper II with the section, 'Technology'. The candidate also submits for assessment his coursework which includes, 'working showing general investigations of visual, tactile, spatial and structural qualities', as well as a major design project. With the project he must submit documentary evidence including a report, which, 'indicates the extent to which he has understood the problem and his approach in trying to solve it'. Finally the candidate is interviewed by the examiner as part of the assessment. Much of the judgment in this total assessment must be subjective and has to be taken on trust. At the same time, as with all public examinations, the examining board bears the responsibility of fixing standards and of awarding the final grades. In the case of an experimental syllabus such as this the Schools Council also holds a watching brief. Full evidence is therefore submitted to the Board for this purpose.

It is comparatively easy to judge standards for a written examination but less easy when the papers ask open ended questions (for which there is no 'right' answer) in order to give the candidate an opportunity to demonstrate an ability to, 'see all round' a problem. To judge standards established for individual projects is much more difficult. In the first set these varied from a car (a very concrete and large scale demonstration of a candidate's

thinking) to a candidate who never reached the stage of producing a project but who, in his search for one, revealed a capacity for considering problems. To judge the standards adopted in assessing the interviews between the candidate and the examiner – although tape recordings of these exist – it is even more difficult.

Hence it would be foolish of the sponsors and the examiner if the challenge of demonstrating the validity of standards set was not accepted. It is essential for two reasons that these should be clearly and openly understood; it is hoped that after the trial period other schools will take up this syllabus and they will need to know what is expected of them; it is also hoped that colleges and university departments will accept students into their courses with a pass in this examination and if they do have every right to judge the standards set.

It was therefore decided to mount an exhibition of the work of the first batch of students and this was done at Loughborough College of Education from September 13th to 25th of this year. To arrange such an exhibition in such a way that standards set could be exposed, proved more difficult than at first envisaged. It would be easy to set up the hardware produced but this is only part of the total assessment. The supporting documentation for the project and the supporting practical work was available in some cases and whenever possible this was displayed with the project itself. The scripts for the written examination were restricted and not available for display nor could the recordings of interviews be made available. The grade awarded to any candidate was not displayed and indeed, since the work on show was only part of the candidates work, this would not have been fair or of much use. After some discussion and concern it was decided that the examiners and associated teachers should write a commentary indicating the features that seemed relevant to assessment: extracts from this document are attached.

Criticism was certainly received at the exhibition but the general impression gained was that visitors were impressed with what they saw. As with most aspects of education the only true assessment will arise from the development of the candidates as they face their Higher Education courses and careers. For the record 26 candidates sat (if that is the right word) the examination and the following grades were awarded:

A ---- 1 candidate
B ---- 2 candidates
C ---- 5 candidates
D ---- 8 candidates
E ---- 8 candidates

Two candidates failed one of whom was awarded an O level pass.

The candidates have gone on to a variety of courses and careers as the following table shows

Colleges of Art	6	
Colleges of Education	3	
Universities	3	
Architecture Courses	2	
Other Courses	2	(Building Surveying and Furniture Management)
Other Employment	10	(including 1 chartered accountant, 1 Silversmith, 1 Professional Footballer).

Extracts from Notes on the Exhibition of Candidates' Practical Work

prepared by B. Allison, D. Bradbury, B. Crump, J. Joscelyne, C. Richardson, M. Deere

The Approach to the Course

What is the relative importance of Coursework?

Of the total marks that the course carries overall, 40% is allocated to the two formal examination papers, taken together, while 60% is allocated to coursework. Of this 60%, roughly two-third can be gained by the major project, and one-third by the supporting work.

What qualities do we wish the practical work to develop?

The syllabus lays down some general requirements in this direction, and we can repeat them here. There are really four: a degree of intellectual thought; a capacity for original thought; a sound knowledge of materials and constructional processes; an understanding of human needs.

For the first year of operation, we have used an assessment scheme which seeks to discover and reward a candidate's performance under six headings: *"Extensive" intellectual* powers as seen directly reflected in his work – this means the quality of his specification of the problem, and his evaluation of his design work after completion; more general qualities of thought that are seen throughout his work and referred to as *"intensive" intellectual* powers – this includes the consideration of a range of solutions and the logical reasoning behind the selection made; ability to *plan* design work; the quality of *communication and report* work; the acquisition of a level of *practical technique;* the ability to devise and carry out any necessary *research or experimental work.*

These headings apply to both the main project work *and* the support work, although the weighting may vary between the two areas. However, we do also try to reward a set of qualities, which – in terms of assessment – are rather elusive. These comprise innate design, *skill, originality,* the capacity to put forward *ideas,* and *aesthetic judgement,*. Another difficulty in respect of this group of qualities lies in deciding the weighting that it should receive, for the course is not intended solely for those who have latent natural talent.

How do we assess the required qualities?

We use several methods of assessment. Firstly, there is the *judgement of each teacher* and of the examiner, both of whom try to maintain discussion throughout the course. Secondly, there is the *interview between examiner and candidate* during which the former tries to discover the depth of thinking behind the work done. Thirdly, there is the candidate's project *report,* supported by sketches, diagrams etc. Lastly there is the *candidate's work* itself.

All four methods *must be added together,* but an exhibition only really presents the last two. Sometimes the tangible evidence *is* an adequate reflection of quality, but

sometimes it is not. If you reflect on the qualities that we have described as being important – and we would hope that you will agree that they *are* appropriate to this Advanced Level course – this vital point should emerge the more clearly.

Finally, it may help if we give the assessment weighting used so far, adding the point that experience may well cause us to adjust it. The figures given are the relative weighting factors.

Extensive Intellectual Qualities	(Project)	2
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Planning	(Project)	1
Report etc.	(Project)	2
Practical Technique	(Project)	1
Research and Experiment	(Project)	2

Breadth of other work (i.e. range of design fields covered)	1½
Intellectual (Other work)	1
Research and Experiment (Other work)	1
Construction (Other work)	½
General skill and discriminating Powers	1½

EXHIBIT 1.

The silversmith's bench is the major work. It is a good example of a piece of work that could easily be dismissed as no more than construction, but a great deal of clear thinking was devoted to it as well. The candidate gave a particularly good performance during interviews. In short, he had achieved one essential pre-requisite for good design, he had analysed the problem in terms of function to be achieved. Among several items worthy of note, he was able to justify *shape,* and he was able to justify choice of material, and construction methods and details, in terms of the previously analysed function. The *report* is fluent, but not extensive enough.

The range of other work was satisfactorily wide. A table was designed, not as an end in itself but as an experimental "vehicle" for trying various forms of joint. The jewellery design work may seem rather limited, but it formed an admirable discussion point – allowing the examiner to see something of his 'judgement' abilities. The 'collage' of functional units is not an excercise in depth, but it does show variety and opportunity for a kind of research, and could form the basis of a really demanding exercise.

EXHIBIT 5.

The Bench/Desk unit which forms the project element of this exhibit is original because of its involvement in the volume – production problem. The intention was to produce a unit that could leave the same line either as a desk or a work-bench. This aspect apart, the product shows construction ingenuity – one example is the joint design, and this can result in a lot of thinking reflected in a detailed item that the observer can overlook. Perhaps the most noteworthy aspect of this candidate's work is

that he chose a task which was within his resources, his ability, and his time-scale. As a result not only was the design finished, it was possible to use it under test conditions with a reasonably well-thought-out test programme. All in all this is a most adequately performed project – if it lacks a certain sparkle it represents intelligent choice on the part of the candidate. As one might expect in the light of these remarks, while this candidate's supporting work appears to be no more weighty than that of the previous example, the candidate's subsequent discussion around it did reveal an encouraging degree of insight.

EXHIBIT 6.

This exhibit differs from the others in that it represents a group effort. The chair shown is one of a set produced by four candidates under a "flow-line" organisation. The purposes of the exercise were to: compare the "many-off" with the "one-off" situation, in terms of jointing details, quality and appearance; to give an understanding of the organisation required by forcing the group to organise themselves. These aims were achieved by the task alone, but the point should be made that they were considerably reinforced by subsequent discussion between the examiner and the group. On this occasion the group were encouraged to be self critical and to discuss and evaluate other forms of organisation that they might have adopted.

EXHIBIT 7.

The motor car here exhibited is probably the star of the show. It represents a considerable achievement, and no comment of ours is intended to detract from that. However, it must be said that it was the candidate's dominant spare time hobby, and the target for all his personal funds, as well as being a project topic, and one must judge accordingly. This is the work of someone who prefers to leave the drawing board alone and work on a trial and error basis. This is often the approach taken by the school candidate (as opposed to the 'professional') and it does have its merits. In spite of this, the basic lines were evolved on the board, and this phase was supported by the use of model/test techniques. The other point of interest is that intelligent use was made of existing components, almost all of which had to be adapted. This is an example of the production of something unique from existing elements and it is a useful mode of design that is often forgotten.

The second element of this exhibit that is worth mentioning is the small steam turbine. This is again an original and self-chosen task which makes demands both in terms of technical background knowledge and precision construction.

EXHIBIT 8.

In direct contrast to strongly technological exhibit 7 we see here the work of an Art-based student. This will be evident from the excellent illustrative material, but the thing to note is the fact the design of the project (the portable garage) is based on scientific testing. This task was practical (the need was real enough), original (the need was met quite satisfactorily) and above all was well chosen in relation to the

candidate's resources, ability and time-scale. On the debit side, the final report is thin. The supporting work shows a fair breadth of interest, although one might justifiably argue that this is no more than one could expect for this type of student. However, we can still learn – witness the simple machine sculpture brief and others like it. This is yet another example of a case where one can force the candidate into complex thinking beginning at this kind of simple exercise – it does not come over in a static exhibit, but it is very obvious during interviews and discussions. One may take as an example the chess pieces. How do the chosen forms reflect the purpose and action of the individual pieces? The trains of thought that this question can trigger can be quite remarkable.

EXHIBIT 9

For us, a lot of the fascination of this course lies in the contrasts that we met. We see here one of the surprisingly few electronic based projects, produced by a candidate whose other 'A'-level work was Maths and Physics. The report reads very well, and the insight into the problem shown by this and subsequent discussion was certainly above interest. By contrast to the car designer this *is* a drawing-board based project, but this may be a misleading comment, for some may say that electronics lends itself to this approach more than do mechanical problems. Turning aside from this, the encouraging factor was the extent to which the candidate showed insight into the more art-based supporting work. Once again he showed great intelligence in the way he was able to discuss the fuller meaning of an apparently trivial exercise. One must again emphasise the point – trivial exercises may be just that, but with insight and the correct approach on the part of the teacher they can show a much greater pay-off.

EXHIBIT 10

We see here as complete a contrast as one can imagine. The main project here is a book! It is, in fact, an instructional book on pottery, but it fulfils all the requirements of a design task as we understand it. It has to be planned, a process (in this case largely hand-skill) and its associated material (clay) has to be studied in depth, while the needs of the customer have to be recognised with more than usual accuracy. This is not nearly as off-beat a project as it looks, and in this case the candidate's performance was creditable. We hope that this idea will trigger off similar approaches to different fields.

The supporting work is good in quality, but – taken with the project – represents a rather limited scope. Yet again we see the simple exercise which can be the vehicle for real depth-learning, while the notion of producing a reasonably familar device (a universal joint) in an unusual material should be noted.

EXHIBIT 12.

The catamaran featured here represents a most interesting design task. A good project can often be marred by poor reporting and communication, but this exercise was well recorded in diary form, and the report makes informative reading. The project is weak

from the planning point of view, but a project that shows a good measure of advance-planning is rather rare. The two aspects to which we want to draw attention here are these: the floating "test-bed" made from oil drums, used by the candidate to gain some necessary initial information and experience, and the ingenious adjustable polystyrene cutter. This latter, intended to expedite an essential constructional process, might be seen as a subsidiary item, but it shows ingenuity and effective thinking on the part of the candidate. Indeed, it can stand as a project in its own right.

EXHIBIT 15.

The reason that this exhibit is limited to models is that the full size prototype is now in use. The design problem, entirely self-chosen, was to design and build a set of simple modular furniture for use in a holiday cottage or bed-sitter. It will be realised by now that the favourable economics of modular systems – provided that they are well designed – exercises quite a powerful fascination. In this case the units could be arranged as tables, chairs, settees, beds, and even cupboards. A detailed, but vital, design aspect was the fixing and joining device which would allow *rapid* re-arrangement.

The approach to supporting work – in the context of the exhibition – is rather different in this case. We show the candidates "minor-work" file. Not only does this give some insight into the practical work itself, it also gives an interesting overall picture of the design approach. Because the teacher's comments are sometimes rather caustic, it is only fair to add that the pressure paid off, because this candidate's examination performance and practical work assessment gave him a high position on the pass list. A contributory factor was the very comprehensive report which accompanied his completed set of furniture, and which we show here.

(The allocation of marks, printed on the papers, is not recorded here).

PAPER I

SECTION A

Answer **one** question only from this section.

1. There are occasions when a designer sets our deliberately to make his product obsolete over a relatively short period of time. State **three** such examples that occur to you. Explain one of them in detail, saying what obsolescence is intended, how it is achieved, under what circumstances it can be justified and commenting on the possible effects of such obsolescence on the user or consumer.

2. A designer may be:
   (a) a salaried employee of a large industrial group (say with a labour force of over 10,000);
   (b) a salaried employee of a small firm (say with a labour force of less than 100);
   (c) a freelance consultant to a variety of firms, large and small.

   Compare the problems which face each of these designers, and the advantages each enjoys.

3. A County Fire Brigade control room has to include systems which:

(a) give a visual presentation of the location of officers, machines and incidents;

(b) receive emergency calls from the general public;

(c) send instructions to officers and crews of fire stations and fire engines.

The control room is continuously staffed by two operators who receive and despatch messages, together with an officer in overall charge. Each man is on duty for nine hours by day or for fifteen hours by night.

(i) List all the factors that the designer of such a control room must take into account, both from the viewpoint of the operators' efficiency and the safety of the public.

(ii) Outline some tentative ideas for the layout, size and contents of the control room. Use sketches if you wish.

4. A designer is asked to redesign a product aimed at the domestic consumer market. Before he embarks on his detailed design, what kind of information would he require:

(a) from his firm's production department;

(b) from his firm's advertising agency;

(c) from his firm's marketing consultants?

What other organisations, outside the firm, should he consult?

SECTION B

Answer **three** questions from this section

5. **(Figures 1 (a) and 1 (b) are printed on a separate sheet.)**
Figure 1 *(a)* shows a more or less standard stretcher and loading gear. Figure 1 *(b)* shows a more elaborate, multi-position stretcher.
How would you set about preparing a report for the County Ambulance Service, setting out the advantages and disadvantages of each?

6. Discuss the importance of noise levels and colour schemes in working environments. Give two examples of occupations where noise level is significant, and two examples of occupations where the colour scheme is important. For the examples selected, state how difficult and expensive it is to control the noise level or provide a suitable colour scheme.

7. The Electricity Generating Board plans to build a power station close to a middle class housing area. List possible objections to this by local inhabitants and give the arguments which the Board might use to answer them.

8. It has been proposed that the Old Great Central Railway between Nottingham and Leicester should be retained as a 'working musuem'. You have been asked to convert one of the disused stations into a Headquarters. Make notes on how you would seek to create a favourable image and attract visitors.

9. Compare the ways in which factory design of the 1860's and 1960's reflects their respective contemporary social scenes. You should include in your answer the economic situation, the employment situation and the state of technology.

10. Select **one** of the following innovations of discoveries and explain its effect on the design and supply of consumer goods:

(i) modern wood adhesives;

(ii) the automatic lathe;

(iii) injection moulding and vacuum forming of plastics.

11. The design of a product is usually a compromise between the requirements and preferences of the three main parties involved–designer, maker and user. Indicate how, in your opinion, the increased affluence of the man in the street has affected the task of the designer of consumer goods.

12. Mass production and automation have led to the production of goods in ever increasing numbers. As a result, what skills have tended to diminish and what skills have become more important? Give your reasons.

PAPER II

SECTION A

Answer **one** question only from this section

1. What criteria would you use in selecting suitable materials for the following items:

(a) a long-life bearing for a food-mixer mechanism;

(b) a long folding step-ladder intended for use by the home handyman, and produced in quantity;

(c) a three-dimensional replica of an omnibus, produced by a city transport department for presentation to employees and city councillors in commemoration of the transfer of the system to a government authority?

2. Consider the production of packages (or containers) for drinks such as milk, beer and lemonade. Review the various kinds of materials that may be used, and the various container shapes that might be adopted. Discuss the merits and drawbacks of each from the point of view of production, hygiene, handling, transport, appearance, and disposal after use.

3. A toy factory has decided to change from metal to plastics as its basic raw material.

(i) List the reasons that might underly this fundamental change in materials.

(ii) Discuss the processes which must be discontinued and the processes which must be introduced. State also any processes which need not be changed.

4. Select **one** of the following items, and for it describe the most important design changes that have taken place. Explain why you think these changes have occurred and make tentative suggestions as to what the next major design change might be, giving your reasons:

(i) a road vehicle;
(ii) a type of ship;
(iii) a piece of domestic furniture.

SECTION B

Answer **four** questions from this section, chosen from one or more groups

GROUP I, WOOD

5. Select a piece of furniture and describe the machine processes that would be used to produce it in a modern factory. Refer in your answer to the hand processes which have been replaced.

6. Draw a sketch to illustrate each of the following joints found in wood technology;

(a) A wood-to-wood joint that depends on a metal component;

(b) a wood-to-wood joint using an adhesive.

In each case state on what the strength of the joint depends, and indicate the weakest part of the joint. State a practical application for each.

7. Some properties of timber are not stable. What are these properties, why do they change, and how can the changes be controlled?

What general methods are available to improve the properties of a particular timber for a particular design application?

8. Suggest reasons why timber was chosen for the construction of nineteenth-century railway viaducts in the West Country. Give also your views as to why it might be an inappropriate constructional material today.

9. You work for a firm whose Managing Director is something of an amateur architect, but who has little technical knowledge of the subject. He shows you a sketch of his proposed new office block, which is a reinforced concrete structure to which he plans to add a partial timber cladding. On enquiry

it appears that he has varnished pine in mind. He asks for your comments. State them in note form, together with any further questions that you would find it necessary to ask him before the work could be put in hand.

10. What are the qualities of timber that make it an attractive material to a present day furniture designer? Suggest why this same designer might consider using various metals as a partial replacement for timber.

GROUP II, METAL

11. Give **three** examples of articles or components where metal has been replaced by plastics. For each of them, suggest reasons why the change has taken place. Include reference both to the economics of production and to the properties of the materials themselves.

12. Draw diagrams to illustrate all the various processes that a designer can call upon when using metal as the basic material. You should aim to show the range of alternatives rather than the details of any particular process and may amplify your diagrams with written notes.

13. List and describe the various metal casting processes available to the designer. Comment briefly on each of them with respect to:

(a) the various metals that can be so processed;

(b) the quality of the product produced by them;

(c) their relative economic advantages for volume production.

14. List the various surface finishing processes that the designer of metal products might use. State for each item on your list the purpose or purposes for which you think it is intended.

Choose one example from your list, and briefly state the steps in the process, indicating how its purpose is achieved.

15. Compare the characteristics of rivets, electric welds, and self-tapping screws from a designer's point of view. For each of these three methods give one example of an appropriate application.

16. Describe briefly two modern electrical and/or chemical methods of removing metal in order to create specific shapes. What are the advantages of these methods compared with the traditional metal-removing processes? Mention any disadvantages.

GROUP III, CERAMICS

17. State **one** example of an industrial application of ceramics. What different factors might the designer of this example have to consider compared with his colleague concerned with domestic or decorative products?

18. If you had the job of inspecting the output of a pottery producing a range of domestic products, for what faults would you look? How would you recognise them, and how might they have arisen.

19. List three types of clay. Describe in detail how they differ from one another and give, with your reasons, an example of an application for each of the three.

20. Describe the processes of slip casting, throwing and pressing, indicating the various stages and skills required for each. State the types of material suitable for each and suggest the type of work for which each process is most suited.

21. A friend asks your advice about his intention to commission a large decorative ceramic panel for the outside of a new office block. List and discuss the factors that you would suggest he keep in mind when choosing between the designs and specifications submitted.

Prepare for him, in simple note form, a short brief that he could use when discussing their proposals with the designers concerned.

22. Describe the changes in decoration due to changes in materials or processes which have taken place in respect of domestic table-ware over the last hundred years. Include in your answer the underlying reasons for these changes.

This special sheet is for use in Question 5. It is not required by the examiner and must **not** *be handed in with your script.*

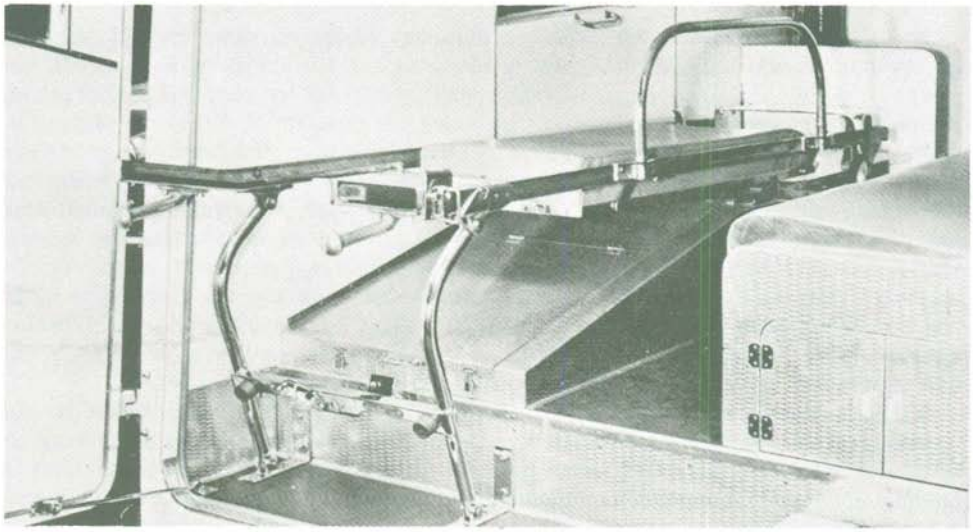

FIG. 1*a*

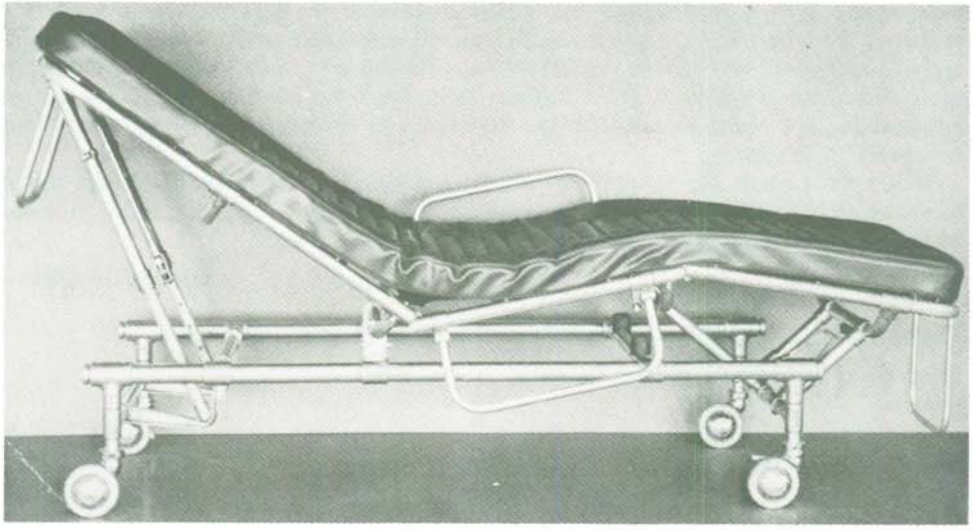

FIG. 1*b*