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18th October, 1957

Dear John:

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I was very glad to hear from [redacted] that you are keeping fit and are still engaged in the study of Soviet automation. I was very impressed with your report (C.I.A./R.R. P.R.-161) which expressed so clearly my own views on the trends in U.S.S.R. on automation - that word has been responsible for so much muddled thinking that I am now using the terms 'mechanisation' and 'control engineering' wherever possible to cover the two branches of the very wide field.

Frank told me that you were anxious to get some critical comments from me on the report, so with the proviso that I am in general agreement, here goes:

Page 1, para. 1. The essential point is not made, namely that although earlier applications of automation were military, the U.S.S.R. realised from the start that the basic principles were the same whether the application was to be military or civil, and text-books setting out these basic principles as applicable to industrial automation were available in U.S.S.R. long before conditions permitted the implementation of the principles. In the West much of the design and research data has even now not been written down in a form suitable for teaching at technical colleges. The piston plant is a long-term technological development and has been running since 1950, with no immediate military significance.

Page 2, para. 2. This implies that there is no stage between the transfer machine line and the fully computerised automatic factory. In fact, there is no doubt that computer-controlled automatic lines, as distinct from whole factories, are likely to be extensively used within only a few years. The need to study control engineering is evident now, and nowhere is its absence more noticeable than in the Western machine tool industry, which has yet to make full use of feedback control [redacted] 25X6

Page 2, para. 3. Although U.S. has automatic lines for making most of the engine components, none of the lines is in fact as completely automatic as the Soviet piston line - it may be far too automatic for economic operation but nevertheless it is automatic to the n^{th} degree.

Page 6, line 4. Soviet research on overall systems involving new methods of forming metals is perhaps a little played down here - the essential feature of Soviet thought is the overall concept of a principle of control irrespective of the means of achieving it, as distinct from an adaptation of existing methods to a control system.

Page 8, para. 1. I know of nothing to suggest that the design of computers was in any way dictated by military requirements. The first computers, as in the West, were mathematical machines designed to solve general scientific computational problems, and although the military probably had priority use of them during the first few years they were not specifically military computers.

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The Soviet approach is such that they are prepared to make fundamental changes in processes and designs. Indeed, this must be the direct outcome of the vast technical research staffs (4,000 in E.N.I.M.S.!) concerned with basic research on practical engineering problems.

Page 12, para. 3. The fact that the piston plant is too automatic and rigid should, in fairness, have a cross reference to para. 2 page 28 because the most important feature to get across to our political seniors is that U.S.S.R. is in a position to undertake experimentation on full-scale plant at a cost outside anything which a private enterprise concern could contemplate and the results of such research can only be to their advantage.

Page 11, para. 3. I think it should be made quite clear that although Soviet leaders considered that the Academy of Sciences "devoted insufficient attention to technological research based on its scientific findings," evidence is perfectly clear that the degree of research and overall control on industrial engineering problems by the Academy always has been far greater than is exercised by any such body in the West. In no Western country does the Academy or its equivalent comprise so many Academicians who are expert in practical engineering research problems as distinct from basic 'Science', and the changes recently brought about intensify an already concentrated effort.

Page 19, para. 3. It is worth noting that some of the most important research on control engineering and machine tool design is now coming from Kiev, Ukr. S.S.R. which looks like becoming a major centre of first class research.

Page 23, para.23, A.1. This is a most important statement. There is a curious tendency among non-scientists in the West to assume that research on basic scientific problems such as nuclear fission, aerodynamics etc. is a real scientific matter but that advances in engineering especially in the machine tool field just somehow generate themselves or at best do not require anything like the same degree of skill. This is very far from being true, as the Soviets have for years fully recognised. They have first-class research workers in the machine tool industry undertaking basic research into everyday practical problems - one has only to look at any Soviet text-book to see that engineering is taught on a mathematical basis, and such text books in general have no Western counterpart; indeed, [redacted] are now quite regularly telling us that if only translations were available, they would like to adopt the Soviet books for their own teaching purposes.

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Page 25.3. The Soviets are conducting research on a big scale into the determination of the dynamic characteristics of processes, the Chemical and Metallurgical, which is essential before overall computer control can be applied. In the steel industry a whole plant is under control of the research organisation and a computer has been in use for 3 years exclusively on these problems.

Pages 27-31. I would emphasise again that Soviet research is concerned with problems of theory of machines and machine design, tool vibration etc. which are basic and quite distinct from (and in addition to) development of new machines or lines based on existing knowledge.

/Page 32

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Page 32. The Soviets are lagging behind the West in the application of computers to machine tool control, but since the main problems of such a combination are in the realm of machine tool design and not associated with the computers, there is little doubt that the Soviet research on modern theory of machines is likely in the long run to produce better computer-controlled machines than have been produced in the West where computers have been coupled to existing machine tools (and there the trouble starts because the computer control makes demands on the mechanical system outside the range of normal machine design practice).

In these remarks I have probably stressed many points which, in fact, you had in mind when you wrote the report. However, if this starts a more frequent exchange of notes on technical matters it will have served a purpose.

With best wishes,

Yours sincerely,

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