THE SELF ADAPTIVE FLIGHT CONTROL SYSTEMS
SYMPOSIUM

SESSION III

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In order to add a little something either as confusion or clarification to this symposium, I will take a few minutes, while there are still people coming in, to try to illustrate what I think of adaptive controls and optimalizing controls, so far as definitions are concerned.

The question has been raised, why should you work with a thing that you call an adaptive control, and what do we mean by optimalizing control and is there any difference? I can give a couple of examples that are merely illustrative but perhaps will illustrate one or two of the concepts involved. Now the idea that became an optimalizing control was really an adaptive control in the beginning. This was a control that changed the parameters on a system operating under conditions that could not be predicted. The simple situation was that of an anti-aircraft system. Hitting the target would always be easy if the pilot was cooperative and continued to fly a smooth course. Then there was no need of changing the parameters of the system. However, if he did not cooperate, and I am sure he never intended to cooperate, but started on a group of basic maneuvers in which the rate of change of range and angular velocity both began to show considerable change, the adaptive system was then made to shift the parameters of the fire control system to make it faster in order to keep up with this unpredictable performance that the target was putting on. You couldn't hope to hit him but you could hope to stay up with him in such a fashion that if you smeared around your shots where he was, he would be in considerable danger if he made any mistakes. This was a method of adapting a control from the feedback not from the output. The rate of change of the inputs were used to change the condition rather than the parameters of the system; the optimalizing of the system on the other hand definitely was intended to utilize some type of an operating arrangement that did have an inflexion point in the performance curve. For example, the case of fuel mixture ratio. In that instance the system could have been predicted and you could have put in a programming control. If you didn't know what the program was, then changing the mixture ratio and seeing what happened, and comparing that with what had happened before you made the change, would allow you to optimalize the system. In this case you could have done it with programming, but in order to do it with programming you would have to determine the characteristics of the system. The whole philosophy was merely that of using the system itself as a measuring device for telling you what the performance was under a given condition and determining how that performance changed when you changed one of its parameters. These are a few ideas that are a little different. I think they will add a little more confusion perhaps to an already confused situation.