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DISCUSSION

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The main purpose of this investigation is to save time and money in the aerodynamic testing of full-scale transonic compressor rotors.

The rotor is brought to speed in vacuum, a diaphragm is opened, and the test gas allowed to flow for a time of the order of 0.1 s, during which the rotor is driven by its own inertia.

The authors promise to get both steady-state performance of the rotor and the wake structure downstream of it. The very sensitive instrumentation was used for survey of the flow field.

If we compare the time of testing 0.1 with the time of passing the gas particles along the chord of the blade $t_b = c/v_{tip} = 83/330 \cdot 10^3 = 1/4\ 0.001$ s and the time for one revolution $t_r = 1/160 = 6 \cdot 0.001$ s, it would be possible to say that we have plenty of time to get the steady-state data.

But in this comparison, we did not take into account the boundary layer behavior in the unsteady main flow. This unsteadiness of the main flow will influence the flow separation on the rotor blades.

Figs. 21*(b), (c)* show this separation for the swirl angle β_3 and for the rotor exit Mach number M_3.

Fig. 21*(a)* shows the large scattering of the total pressure P_{t3}. There is no explanation what the difference is for the test data Nos. 73, 74, 75, 77, 83. What are the time intervals for those tests?

To prove the validity of this approach it is important to test on MIT facility some rotor, the performance of which is known by regular testing, and to compare the results.

The data of this paper should be considered of preliminary ones and we are waiting for the development of this approach.

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Authors' Closure

The thoughtful comments of Professor Beknev are appreciated. They may be somewhat confusing to readers, as they refer to a draft of the paper in which the Mach number, flow angle, and stagnation pressure for several different experiments (Nos. 73 to 83) were displayed on a series of Figs. 21 *(a), (b), (c)*. These data were obtained by time-averaging over only several (about 15) blade passing periods for each of the experiments. They showed considerable scatter, as noted by Professor Beknev. In preparing the final draft of the paper, these data were averaged to give Fig. 21.

In the authors' view, the ensemble average, represented by Fig. 21, is representative of the type of data obtained in conventional compressor tests, where the frequency response of the instrumentation is such that only long-time averages are available. These data, as presented in Fig. 21, are *very reproducible* for the Blowdown Compressor, as for steady-state experiments. The data as originally presented shows fluctuations on time scales less than one rotational period, which we feel are intrinsic to real compressors, and must be accounted for in any precise modeling of compressor behavior. They are not observable with conventional instrumentation.

Thus, we suggest that in comparing the time-resolved data to conventional low frequency response data, we should really ask what the significance of the latter is.

We agree with Professor Beknev, that a test on the M.I.T. facility of a rotor well understood in the conventional sense, is highly desirable.

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