For the series of shots at 25 kbar driving stresses, it was observed that the elastic wave amplitudes for a given propagation distance were somewhat inconsistent from sample to sample. This effect is illustrated in Fig. 27 where two different specimens, each about 2 mm thick, were impacted with an aluminum projectile. Although these two samples appeared to be approximately in the same initial state with respect to dislocation densities and chemical purities, there is a significant difference in elastic precursor amplitude and structure in the two cases. In addition, it was found that high-temperature annealing did not appreciably affect the structure of the profiles shown in Fig. 27.

Another point illustrated in the figure is that the overall profile of the wave corresponding to the higher Hugoniot elastic limit is more spread out than in the other. This spreading behavior has been observed on all of the specimens tested and, in general, increases with increasing sample thickness. The magnitude of the effect appears to be a function of elastic precursor amplitude, as illustrated in the figure.

The way the profile changes with propagation distance is further illustrated in Fig. 28. This profile was obtained from a sample about 15 mm thick. The rise time of the plastic wave for this sample is about 4 times that for the thinner specimens. This suggests that the profile may not be steady, even for large propagation distances. Another important point illustrated in the figure is the transitional behavior of the wave shape between the elastic and plastic waves, indicating a third wave. Since static equation of state work does not indicate a volume transition in LiF for the stress levels studied here, the cause of the transitional behavior in the waveform is not presently understood.

The primary objective of future experimental work in lithium fluoride will be to isolate the causes for the lack of reproducibility observed in the present work and to establish a precursor decay curve for lithium fluoride in an initially known state. Secondly, we will study the profile of the plastic wave in more detail, with an emphasis on the conditions under which the profile becomes steady and how it changes with different driving stresses.