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COVER: Is reason sufficient to give men knowledge, or does the nonrational perspective also have a place? Is the great logical edifice of science too restrictive for the human spirit and, if so, what are the alternatives? These questions are the subject of the summer issue of *Daedalus*, which is reviewed on p. 92. (Drawing: M. C. Escher, Escher Foundation, Haags Gemeente-museum—The Hague)

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August 10, 1974

To the Editor

Aircraft crash tests

A recent issue of SCIENCE NEWS carried an excellent account of the aircraft crash research activity being conducted by NASA at its Langley Research Center (SN: 7/6/74, p. 10). Undoubtedly much benefit to crash-survival aspects of aircraft will result, and will also probably aid in protecting passengers in automobiles and other vehicles.

However, the article intimates that this is the first such research. To the best of my knowledge the first crash tests with aircraft took place at Wright Field about 1924. The aircraft, DeHaviland bombers converted to carry air mail, were run down a ramp under power and crashed into a concrete wall. The purpose was to discover why this airplane caught fire so quickly following a crash landing. The experiment was successful.

The next aircraft crash tests were instigated by Hugh De Haven, father of crash injury research, at the Cornell University Medical College in New York. This was in the spring of 1942. A Piper fuselage was allowed to run down a steel cable 60 feet long with a drop of 9 feet and decelerated in a distance of 7 to 8 inches. Much was learned from studying the actions of the dummy inside the cockpit.

The next tests were very elaborate ones conducted by NASA (then NACA) at its Lewis Research Center about 1954-55. Large and small aircraft were crash tested to study the crash fire problems, crash impact, seat design, etc. These were of great significance to the design of today's transports. Irving Pinkel and his group of engineers received an award for the excellence of this program.

About 1964-67 the Aviation Crash Inquiry Division of the Flight Safety Foundation, under contract with NASA, FAA, the Army, conducted a considerable number of controlled crashes of airplanes and helicopters. A DC-6 and a Constellation were among the transports that were crashed. The helicopters were both drop-tested and crashed from actual flight by remote control. The lessons learned are incorporated in today's airplanes and helicopters.

It is very heartening to know this work is being continued with greater sophistication by NASA at its Langley Research Center, especially in connection with light airplanes.

Jerome Lederer
(Retired Director of Safety, NASA)
Washington, D.C.

Time navigation

The article called "Time Web," about the Naval Research Laboratory's TIMATION program, written by Jonathan Eberhart (SN: 7/13/74, p. 27), was both timely and extremely well written. Mr. Eberhart is to be congratulated for his very accurate and informative presentation.

You will be pleased to know that the latest TIMATION was launched on schedule, July 10, 1974, and is now functioning perfectly in orbit.

Roger L. Easton
Naval Research Laboratory
Washington, D.C.

Metric units of force

Walter L. Rees says (Letters SN: 7/20/74, p. 35) that his physics text by Sears uses newtons and dynes as metric units of force.

University Physics by Sears and Zeman-ky is taken from the larger text by Sears. It explains that, "The 'kilogram force' is used as a force unit in engineering work in those countries which use the metric system exclusively" (p. 78, second edition).

Engineers do not think like physicists. One obvious example is that they like to use as a unit of force the commonly used unit of weight. In the United States engineers use the pound as a unit of force, based on the weight of a standard object also used as a standard unit of mass in the past. This is now defined in terms of the kilogram. The slug is then a derived unit of mass. The Russian engineers use the kilogram as a unit of force, the same as engineers of other metric countries.

Too bad the engineering teacher was too provincial to mention that.

Reuben Wolk
Miami Beach, Fla

... Using the kilogram-force for Venus should be a no-no. If the metric engineering system is justifiable at all, it is so only on earth. Like the British engineering system (pound-force, poundal, slug, etc.), engineers have been fighting it for years.

Jerome S. Schaul
Bloomfield, N.J.

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