were chosen to serve as test cases. It was stipulated that the remaining 97 cases would be determined by the decision of the first eight. All eight were won and are being appealed by the government. The damage total for the first eight cases was slightly more than $18 000.

It was the contention of the FAA during the test program that only poorly constructed buildings could be affected by the booms. Actually this was all part of the "big sell" to lay the ground work for the Super Sonic Transport. Every possible trick was used to rig the results of the tests. These rigged results are still being doctored to meet the new selling program for the SST.

My home took from mid September of 1961 until 15 Jan. 1963 to build. It is built upon a pier and grade-beam foundation. The center load-bearing structure is steel. The foundation contains 4000-pound-test concrete, 184 yards of it. The sonic booms caused the bedrock beneath my home to shift along the geological fault, thus cracking my foundation and floors.

During May or June of this year Doubleday will publish a book by Don Dwiggins called *The SST—Here It Comes, Ready Or Not*. I suggest that the writer of your article might read that book.

BAILEY SMITH
Oklahoma City

Air-coupled seismic waves?

Effects of the sonic boom from supersonic aircraft are similar to those produced by blast waves that, because of atmospheric wind shears and temperature inversions, return to earth at long distances from the original source. In studying such phenomena it is often difficult to explain the effects produced in terms of the shock overpressure alone, and on occasions significant effects appear to be associated with seismic surface waves. It appears probable that surface waves of this magnitude would be possible only if they were coupled to the air shock wave. Seismic waves travelling in a layered medium, in which the seismic velocity increases with depth, form a dispersive chain of waves whose velocity of propagation depends on the frequency of the wave. If the seismic disturbance is generated by the loading of an air wave passing over the surface of the ground, the seismic wave with a frequency such that its velocity is the same as that of the advancing air wave will not dissipate in the direction of the wave but will, in fact, continue to absorb energy in a resonant manner and reach an unexpectedly large magnitude. Such air-coupled waves would appear to be a very likely phenomenon associated with sonic booms travelling over the surface of the ground at a constant speed. The acceleration record shown as part of figure 11 in Harvey Hubbards' article appears to be typical of that produced by air-coupled surface waves. The frequency content of sonic booms and the typical velocity of the shock front over the ground would appear to be close to ideal for the production of air-coupled waves. The geological structure of some regions in the path of supersonic transports may also lend itself to the production of this phenomenon. This effect may have been taken into account in considering the effects of the shock waves from supersonic aircraft, but I have not seen it discussed in the literature.

J. M. DEWEY
University of Victoria
Victoria, British Columbia

Criteria for sonic booms

Your February editorial asks two questions: (1) ". . . if . . . if . . . why can we not show our neighbors that our methods are strong, *our criteria valid*, and our concerns interesting?" and (2): "If there is a relation between *science* and the human condition, how shall *we* demonstrate it?" (All italics mine.)

Answering question 2 first: It is arrogant, and solecistic, to switch from "physics" to "science" and assume that "we" the physicists speak for *all* science. Let physicists learn much much more of *other* branches of science, and show how *they* relate to human conditions.

Answers to question 1: To show neighbors that physics has valid criteria, you first have to have them and then demonstrate them. The article in this same issue on "Sonic Booms" by Harvey H. Hubbard demonstrates clearly the lack of such criteria. He says, "There are those who would ban the supersonic transport . . . others are taking a more realistic approach. . ."

Who would want Hubbard to ordain matters of human condition when he has clearly already made up his mind

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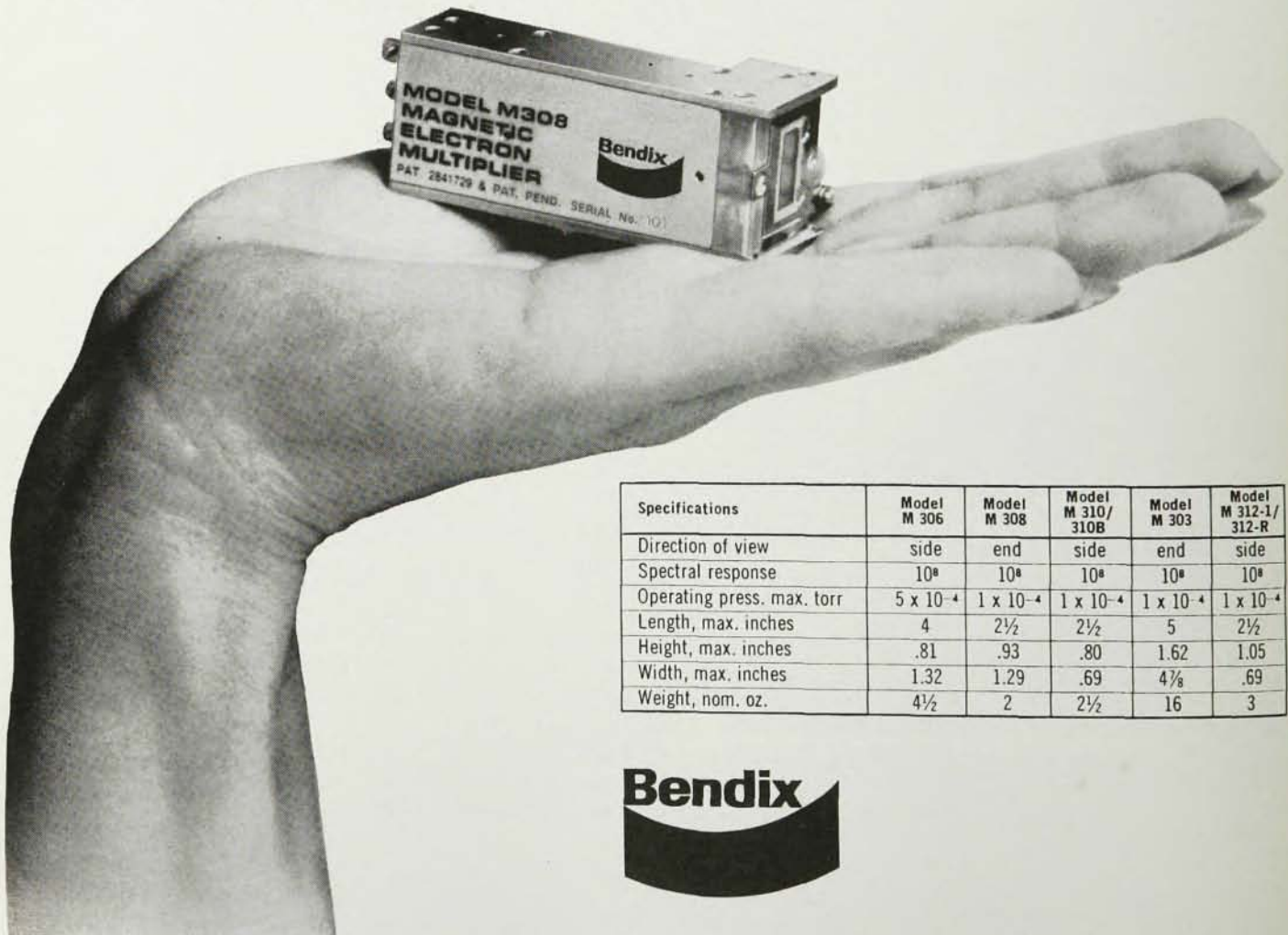

Specifications	Model M 306	Model M 308	Model M 310/ 310B	Model M 303	Model M 312-1/ 312-R
Direction of view	side	end	side	end	side
Spectral response	10^8	10^8	10^8	10^8	10^8
Operating press. max. torr	5×10^{-4}	1×10^{-4}	1×10^{-4}	1×10^{-4}	1×10^{-4}
Length, max. inches	4	2½	2½	5	2½
Height, max. inches	.81	.93	.80	1.62	1.05
Width, max. inches	1.32	1.29	.69	4⅞	.69
Weight, nom. oz.	4½	2	2½	16	3

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that the supersonic transport *will be* and therefore acceptance of such a device is "realistic," and he will ". . . minimize the effect. . ."

Do humans have a choice or not? Why and/or why not should supersonic transports be built? Are there cogent *human* reasons why *any* sonic disturbance from civilian aircraft need ever be tolerated? Aircraft manufacturers, NASA and others take it for granted that this will come to pass, and therefore it is "realistic." Perhaps they are correct.

But where do the criteria of physics, as now practiced, include *any* reference to the *human* condition, that many humans *object* to things that "can startle people and shake buildings?" Does physics have a formula as to how big a minority must be to be protected? Does physics offer any proof that it is *desirable* for some people to startle others?

J. B. HATCHER
Minneapolis

Rights of society

The article by Harvey H. Hubbard on sonic booms is interesting. However, I do have reservations about his last paragraph, which is so typical of our attitude toward undesirable man-made environmental changes that I would like to restate it (italics mine):

"Because booms can startle people and shake buildings and their contents, there is serious concern for public acceptance of the sonic boom. As a result, supersonic transport will be limited initially to overwater operations. There are those who would ban the supersonic transport altogether, and a society for this purpose has been formed. Others are taking a more *realistic* approach. Consideration is being given to the development of advanced-design aircraft that would minimize the effects of sonic booms. Backup research is *already* under way."

What is so unrealistic about banning the supersonic transport altogether? Aren't supersonic transports made by human beings to serve other human beings and doesn't society have the right to decide whether it is desirable to have supersonic transports?

And what is so laudable about backup research on sonic booms being "already" under way? I, personally, am looking forward to supersonic travel. However, I would want to insist not only that backup research continue, but that the problem of sonic booms be solved in a socially-acceptable manner before transports are allowed to cross the continents. In fact, I think society has every right to insist that standards for acceptability be developed and framed into legislation before that day.

MARTIN O. STERN
La Jolla, California

SST as pollution

Harvey H. Hubbard comments, "There are those who would ban the supersonic transport altogether . . . Others are taking a more realistic approach." To me, the SST falls in much the same category as pollution: It has the same effect of demeaning the level of life for large masses of the earth's inhabitants. The only reason for its existence is the profit of a very small minority, or perhaps the national prestige. But I am not convinced that either one is worth the cumulative price that will have to be paid by society, and until I am, I must disagree with Hubbard and claim that stopping development of the SST (at least with government funding) is the only realistic approach.

JAMES B. CONKLIN JR
University of Florida

THE AUTHOR REPLIES: Bailey Smith cites a federal court case in which he was awarded $10 000 for sonic-boom damage and implies that the government made full payment. I have been informed by knowledgeable people that the government has made no cash settlement in this case.

References are made to sonic-boom-induced structural damage, and it is a matter of record that sizeable awards have been made to property owners for alleged damage. Paid damage claims, however, do not constitute scientific evidence of damage. In retrospect it is realized that many of these claims were paid without proper validation. It is also the considered opinion of many reputable engineers that in cases where damage was observed coincident with the occurrence of a boom, the latter was only an extremely small contributing factor.

John H. Wiggins Jr in the June 1967 issue of *Materials and Standards* cites evidence that boom-caused cracking in houses is below the "noise level" generated by natural causes until the nominal overpressures exceed about 10 pounds per square foot. He indicates,