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A SUMMARY OF XB-70 SONIC BOOM SIGNATURE DATA

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SUMMARY

This paper provides a compilation of measured sonic boom signature data derived from 39 supersonic flights (43 passes) of the XB-70 airplane over the Mach number range of 1.11 to 2.92 and an altitude range of 30,500 feet to 70,300 feet. These tables represent a convenient hard copy version of available electronic files which include over 300 digitized sonic boom signatures with their corresponding spectra. Also included in the electronic file is information regarding ground track position, aircraft operating conditions, and surface and upper air weather observations for each of the 43 supersonic passes.

In addition to the sonic boom signature data, this paper also provides a description of the XB-70 data base that has been placed on electronic files along with a description of the method used to scan and digitize the analog/oscillograph sonic boom signature time histories. Such information is intended to enhance the value and utilization of the electronic files.

INTRODUCTION

Over the past few years there has been a renewed interest in high-speed commercial flight with particular emphasis on addressing environmental issues (refs. 1-3). Sonic boom is one of the environmental issues of concern for High Speed Civil Transports (HSCT). A considerable amount of effort is now being focussed on this topic, following a long period of inactivity subsequent to the cessation of the NASA/DoD/FAA sonic boom activities in the early 1970's. A significant initial event was a meeting of a panel of experts from industry, government, and university (ref. 4) to discuss the current status of sonic boom methodology and understanding, in particular, any advances or breakthroughs that may have resulted beyond that summarized at the second sonic boom symposium (ref. 5). Of particular interest is the measured sonic boom signatures for large heavy aircraft operating in the Mach-altitude range comparable with HSCT. NASA has recently provided electronic files of tabulated sonic boom signature data from several flight tests (refs. 6-10) along with airplane operating conditions and surface and upper level atmospheric information. The U.S. Air Force has also completed a series of sonic boom overflights (ref. 11) involving eight different supersonic aircraft and similar information is also provided on electronic files. Such electronic files will permit more effective and efficient use of these measurements in providing insight into generation, propagation, and prediction of sonic booms.

The XB-70 is the largest aircraft for which sonic boom measurements have been obtained. A total of 12 flights (19 passes) were made with this aircraft over an array of microphones during the time period June 1966 through January 1967 as part of Phases I and II of the National Sonic Boom Program (ref. 6) and provided a data base of sonic boom signature characteristics acquired from 114 boom measurements. These latter data are presented in reference 7 and are available on the previously mentioned NASA electronic files.

A large number of sonic boom measurements were also obtained on the XB-70 during the time period March 1965 through May 1966. These data, which were documented in the form of internal memoranda only, also provided inputs to the U.S. SST Program, particularly with respect to the expected magnitude of sonic boom overpressures for large commercial SST's. The measured signature data contained in the numerous internal memoranda have also been used to confirm the existing prediction schemes (refs. 12-14) and have added to the data base relating to the variability in signature characteristics due to atmospheric effects (ref. 12). Complete documentation of sonic boom signature information, including aircraft operations and atmospheric conditions acquired during this latter time period (March 1965 through May 1966), has not been available in hard copy or on electronic files.

NASA, therefore, undertook the task of placing this previously unreported XB-70 sonic boom data onto a electronic data file compatible with the previously mentioned NASA sonic boom electronic file. In addition, this present file includes the digitized boom signatures and spectra from the copies of the original oscillograph records. The utilization of the sonic boom electronic data file in quantifying effects of atmospheric turbulence and molecular absorption on sonic boom waveforms is a major thrust.

The purpose of this report is to provide a hard copy summary of the measured sonic boom signature data derived from the 39 supersonic flights of the XB-70 (43 passes) over the Mach number range of 1.11 to 2.92 and an altitude range of 30,500 feet to 70,300 feet. In addition, this paper also provides a description of the XB-70 data base that has been placed on electronic file along with a description of the method used to scan and digitize the analog/oscillograph sonic boom pressure time histories.

NATURE OF DATA BASE

This section provides a description of the method used for the compilation and documentation of the XB-70 data base. Included is a description of the test aircraft, a summary of XB-70 flights, an indication of the basic aircraft flight plan and sonic boom measurement sites, aircraft position and operating conditions, atmospheric information, measured sonic boom signatures, and the method involved in scanning/digitizing the above information. The NASA Flight Research Center, with the cooperation of the U. S. Air Force, North American Aviation, Inc., and the Federal Aviation Agency, took advantage of the opportunity to measure and document the sonic booms generated during the supersonic phases of the Air Force XB-70 flight demonstration program. As a result, the data reflect no systematic parameter variations, uniformity in instrumentation layouts, or completeness in vehicle flights and atmospheric data.

Each sonic boom run was initially documented in memorandum form. Included were: a brief information cover page; a table listing the measurement location, flight number, weight, Mach number and altitude conditions measured and, in a few cases, predicted overpressures and pertinent remarks; a sketch of the microphone arrangement; aircraft ground track in relation to the instrument site; flight parameters from the on-board data system; upper air temperature and wind velocity profiles; microphone calibration curves; and copies of the oscillograph traces of the sonic boom signatures. During a few of the sonic boom runs, chase aircraft were involved in the XB-70 operations. These chase aircraft, which were not tracked, trailed the XB-70 by about 0.5 to 60 seconds and flew at the same Mach-altitude conditions as the XB-70. Boom signature information from these chase aircraft was also included in the original documentation.

Description of Test Aircraft

The majority of sonic boom data presented in this report and on the related electronic files are associated with the 43 passes of the XB-70. In addition, during the early portion of the flight test program there were 10 passes that involved chase aircraft and sonic booms were also acquired on these aircraft which included the B-58, F-4, and T-38. Descriptions of the primary and chase aircraft are presented in figure 1.

XB-70. - Figure 1(a) is a photograph and three-view sketch of the delta-winged XB-70 aircraft. The XB-70 is the largest U.S. supersonic aircraft for which sonic boom measurements have been obtained. It is powered by six turbojet engines, all housed side-by-side in a rectangular arrangement, and has a length of about 185 feet and a span of 105 feet. Takeoff gross weights varied from about 440,000 pounds to 535,000 pounds and aircraft weights at the time of boom were on the order of 300,000 pounds to 470,000 pounds. These weight estimates are believed to be accurate to within $\pm$ 10,000 pounds.

Both the XB-70 #1 and XB-70 #2 aircraft were involved in the sonic boom flights. These two vehicles are essentially similar in all aspects with the exception that the #2 ship had 5 degrees more wing dihedral. Each aircraft has a "drooped" nose windshield and wing tips that fold downward for high-speed flight. On all sonic boom runs at Mach numbers above 1.3, the nose/ windshield was in an up position and wing tips were at 65 degrees downward. On sonic boom runs at Mach numbers below 1.3, the wing tips were at 25 degrees downward.

Chase aircraft. - Three chase aircraft were involved in 10 of the 43 XB-70 sonic boom passes. The B-58 was involved as the chase plane on all 10 of these flights. On one flight, a F-4 was also used as a chase aircraft along with the B-58 and on another flight the T-38 was used as a chase aircraft along with the B-58. A photograph and a three-view sketch of each of these aircraft is presented in figure 1. The B-58 is a delta wing bomber of about 100,000 pounds gross weight, powered by four pod-mounted turbojets, is about 97 feet in length and 57 feet in span. The F-4 has a gross weight of about 56,000 pounds, is powered by two turbojet engines, has a length of 63 feet and 28 feet in span. The T-38 has a gross weight of about 20,000 pounds, is powered by two turbojet engines, has a length of 47 feet and 25 feet in span.

Summary of XB-70 Flights

This section identifies the number of XB-70 flight operations for which sonic booms were measured out of the total number of flights made by both the #1 and #2 vehicles. Included in the present study are the sonic boom runs that took place during the time period March 1965 through May 1966, and are tabulated along with those flights that were specifically assigned to the Phase I and II National Sonic Boom Program during the time period June 1966 through January 1967, which are documented separately on hard copy (refs. 6-7) and on the previously mentioned NASA electronic files.

Total number of flights. - In Table I are presented a cumulative listing of the flights for both XB-70 aircraft which began on September 21, 1964 and concluded on February 4, 1969. A total of 83 flights were made with the #1 ship and 46 flights with the #2 ship. Also indicated in the table are the pilot/copilot assignments, the maximum Mach number and altitude obtained on each flight, and the total flight time. Note that the highest Mach number and altitude flight (No. 74) of 3.07 and 73,000 feet were achieved with the 32nd flight of aircraft #2 (Flight 2-32) on April 8, 1966. The longest duration of flight (No. 47), 3 hours and 40 minutes, was with the 30th flight of aircraft #1 (Flight 1-30) on January 6, 1966.

Sonic boom runs. - Of the 129 flights accomplished during the almost 5-year flight program involving the two XB-70 aircraft, sonic boom measurements were acquired on 51 flights (noted by the blacked-in circle and square symbols). Of these 51 flights, 39 relate to the present effort (circle symbols) and 12 flights relate to a previously documented XB-70 electronic data base (square symbols).

In Table II is presented a listing of the 39 flights (42 passes) for which sonic booms were obtained during the March 1965 through May 1966 time period, and are reported in the present paper. Included is the flight date, flight number, takeoff time and gross weight, total flight time, time of sonic boom arrival at the measuring site (accurate to within $\pm$ 15 minutes of actual boom time), the aircraft Mach number, altitude, and gross weight at the time of boom, and the aircraft landing weight. It is important to note that Mach number and altitude conditions listed for any given sonic boom run in Table II will, in most cases, not match up with those listed in Table I, since only the maximum Mach number, altitude, and flight time duration attained on the flights are listed in the latter. Also shown in Table II is a column designated DJM File #. This numbering system was added to facilitate the identification of the sonic boom information contained on the electronic files and is discussed in more detail in a later section of this report.

Aircraft Flight Plan and Measurement Sites

The U.S. Air Force XB-70 Flight Demonstration Program involved a basic flight plan/ground track. As such, the sonic boom measurement locations were chosen based upon three key factors: the requirement for an omnidirectional radio range navigation station to guide the XB-70 pilot over the instrumented site, the XB-70 flight plan, and the availability of radar tracking and weather data.

Basic flight plan. - The basic flight area utilized by the XB-70 was contained within a north-south pattern some 600 miles long by 170 miles wide, as shown in figure 2, and includes the states of California, Arizona, Nevada, Idaho, and Oregon. All aircraft takeoffs were out of Edwards AFB, California, which was also the designated landing site. For the 39 flights (43 sonic boom passes) of the present paper, takeoff times ranged from as early as about 0650 hours local time to as late as 1539 hours and flight durations varied from about 1 hour, 27 minutes to about 2 hours, 27 minutes. Although a few sonic boom measurements were obtained before 0900 hours and as late as 1646 hours, the majority of the measurements were made between 1000-1300 hours.

Measurement sites. - The five sonic boom measurements sites utilized for the 39 flights are illustrated in figure 2 and include two sites at Edwards AFB, California; one at Boron, California; one at Beatty, Nevada; and one at Coaldale, Nevada. Of the two Edwards sites, one was located at the east edge of Edwards dry lake and designated Lake site and one was located 6 miles north of Edwards and designed site 3. The inset table in figure 2 lists the five site locations, their elevation, and the sets of measurements acquired at each site. Eight sets of measurements were acquired at the Lake site, and twenty-four (24) measurements were at site 3. The elevations of these two

Edwards sites are 2300 feet and 2700 feet above sea level, respectively. The Boron site is about 12 miles east of Edwards AFB and is at an elevation of 2400 feet. A total of twelve (12) sets of measurements were acquired at this site. The Beatty site, used for only one (1) set of measurements, was at an elevation of 4950 feet; the Coaldale site, used for eight (8) sets of measurements, had an elevation of 4800 feet. All of the test sites were generally flat and free from any obstruction for at least 1000 feet in any direction. Although the intent was to locate the sonic boom measurement site underneath the XB-70 flight track, this was not always possible. As such, the site locations ranged from being directly under the aircraft flight path to as much as 15 miles to the left and 8 miles to the right of the aircraft ground track.

Microphone arrangements. - Two basic microphone arrangements were utilized for the sonic boom measurements at the test sites and these are illustrated in figure 3. One arrangement, shown at the lower left portion of the figure, involved four (4) microphones, three located at ground level at 200-foot spacings and one at a 20-foot elevation. The second arrangement, shown in the upper right portion of the figure, involved eight (8) microphones, six located at ground level at 100-foot spacings and two at a 20-foot elevation and also separated by 100 feet. The 100-foot and 200-foot microphone separations permit a measure of sonic boom signature variability due to atmosphere influences (primarily resulting from the lower layers of the earth's boundary layer). Although the 20-foot microphone elevation is insufficient to completely separate the incident and reflected signatures, it does provide for a measure of "free-air" bow-shock overpressures.

In the majority of the measurement program, the ground microphones were positioned at ground level in a 3-foot by 3-foot board with their diaphragm parallel to the ground surface. This setup was complemented on some of the later flights (8) with a "milk stool" arrangement wherein a few of the microphones were suspended by rubber bands about 9 inches above the ground, the diaphragm still parallel with the ground surface. Although the 9-inch height allows for a shock reflection, it is so minor it had very little effect on the measured signature in terms of overpressure, shock rise times, and signature duration. On four runs, a very thin plastic covering over the entire "milk stool" arrangement of one microphone was examined from the aspects of a windscreen/rainshield. In these relatively few altered versions of the microphone arrangements, side-by-side comparisons were made with the flush-mounted basic microphone placement. The effects regarding overpressure levels and signature shapes for any of the nonbasic arrangements were noted to be minor.

Instrumentation system. - The sonic boom instrumentation system used to record the boom signatures was developed by NASA in the 1961 time period (ref. 15). This basic analog system, shown schematically in figure 4(a), consisted of a modified condenser microphone, tuning unit, d.c. amplifier, and FM tape recorder and had an overall flat frequency response of from about 0.1 Hz to 10 KHz. Playbacks of the analog sonic boom signature data into a recording oscillograph having 5 KHz galvanometers limited the high frequency response to 5 KHz. The transient response of the entire system was evaluated. The findings indicated that the sonic boom instrumentation system is capable of measuring rise times as short as 50 microseconds. Extension of the low frequency end of the system to faithfully reproduce the expansion portion of the sonic boom signature was accomplished by changing the configuration of the microphone vent chamber to extend the low end frequency roll-off from about 10 Hz to 0.1 Hz (see fig. 4b).

Knowledge of the frequency responses of the measuring, recording, and playback systems is, of course, important in regard to the digitizing of the oscillograph copies of the sonic boom signatures. Since the original signatures were played through a 5 KHz galvanometer, the digitizing rate of the optical scanning system should be about 10 KHz in order to maintain the required fidelity in reproduction of the signatures.

Aircraft Position and Operating Conditions

Information relating to the XB-70 ground track and position and operating conditions with respect to the sonic boom measurement site was acquired by means of ground-based radar and the XB-70 onboard data system. The type of information provided by each system during the time of the sonic boom passes, and included in the original hard copy format, is discussed below. Chase aircraft, when involved, were not tracked and information regarding the Mach number and altitude conditions and fuel remaining (to estimate aircraft weight) at time of boom were obtained by the pilot from the aircraft instrumentation.

Ground track. - A typical radar ground track of XB-70 #2, Flight #7 (DJM File #10) at a nominal Mach number of 1.42 and at an altitude of 31,000 feet above mean sea level (MSL) is presented in figure 5. Note that the aircraft was heading north and the measurement site was located 4500 feet to the right of the aircraft ground track. Also indicated on the ground track line at 2-second intervals are time marks from which aircraft ground speed can be obtained. The approximate point of origin of the boom is also identified (that is, the position of the aircraft along its flight path where the boom was generated that was measured at the test site) and is calculated assuming a standard atmosphere (ref. 16). In most of the sonic boom runs, the XB-70 maintained straight, steady, level flight for considerable distances up-track from the point of origin of the boom. However, there are cases where the aircraft was in a slight turn. In all cases, however, the booms can be considered steady-state events.

Aircraft operating parameters. - An indication of the type of information relating to the aircraft operating conditions for XB-70 #1, Flight #45 (DJM File #36) obtained by means of the onboard flight data system, are presented in figure 6. Time histories of altitude, Mach number, angle of attack, and normal acceleration are shown at about 10-second intervals for about a 90-second time period during the sonic boom run. The time of zero origin is usually taken as the overhead position of the aircraft at the measurement site (or closest point of approach from the aircraft ground track to the measurement site). Also noted is the approximate point of origin of the sonic boom which correlates the aircraft onboard operating conditions to the radar ground track information of figure 5. For the flight conditions reflected by the data in figure 6, it is apparent that the XB-70 flight was quite steady in terms of Mach number and altitude (Mach 2.23 and 53,000 feet) and was flying steady at 1g.

Since the aircraft was always under radar control, there are two independently generated sets of data for Mach number and altitude, one obtained from the radar data and one from the aircraft onboard instrumentation. The correlation of these two data sets, presented in figure 7, may be of interest. It can be seen that the XB-70 onboard data shows a slightly higher altitude (about 2000 feet) than the radar data and a slightly lower Mach number (about 0.02 M) than the radar results would indicate. This is expected since the onboard system data were derived from local ambient conditions in real time, whereas the radar data utilizes upper air atmosphere observations based on a standard atmosphere or information from actual sonde launches at location and times different from those of the aircraft. All of the aircraft operational data of the present paper are obtained from the onboard flight data system.

Atmospheric Information

For most sonic boom flight tests, two types of weather information are catalogued: upper air and ground surface-climatological data. During the subject flight tests, data from rawinsonde releases were utilized and documented. These data were recently enhanced with archival upper air and surface data observations from the National Oceanographic and Atmosphere Administration (NOAA) files. Following is a description of the atmospheric data associated with these 39 flights (43 sonic booms passes).

Upper air temperature and wind profiles. - During the XB-70 sonic boom measurement effort in the March 1965 through May 1966 time period, rawinsonde upper air data were acquired from weather stations in the vicinity of the five measurement sites and also within an hour or so before or after the sonic boom run. The weather site was within 15 miles of the two Edwards and Boron, California, locations. For the two Nevada sites, Beatty and Coaldale, weather was obtained from weather stations at Las Vegas and Winnemucca, Nevada, respectively. Las Vegas is about 100 miles south of Beatty and Winnemucca is about 200 miles north of Coaldale.

NASA sonic boom prediction schemes (ref. 16), in existence at the time, called for atmospheric data inputs of temperature and wind information and, thus, this is all that was gleaned from the rawinsonde package; specifically, a temperature profile from near surface level to an altitude 5000 feet or so above aircraft altitude and corresponding profiles of the wind components parallel and perpendicular to the aircraft flight track. An example of such data is given in figure 8 which relates to XB-70 #2, Flight #6 (DJM File #9) flying at an altitude of 33,000 feet MSL at Mach 1.35. Data of the type shown in figure 8 are provided on electronic files for each run.

Archival upper air data. - In order to enhance the value of the sonic boom measurements presented in this paper, particularly with reference to the influence of the atmosphere on signature distortions, NOAA archival upper air data were acquired for the 39 days on which the sonic boom flights were conducted. These standard rawinsonde launches occurred twice per day at 1200 hours and 2400 hours at Edwards AFB, California, and at Yucca Flat and Tonapah, Nevada. These latter two weather sites were used to represent the Beatty and Coaldale measurement sites, respectively. Yucca Flat is about 40 miles east of Beatty and Tonapah is about 40 miles east of Coaldale. These data, like all the atmospheric information cited in this report, are available only on electronic file and will consist of temperature, pressure, relative humidity, and wind speed and direction at significant altitudes (about every 50 mb).

Archival surface-climatological data. - Surface observations, along with cloud cover and precipitation, were not acquired at the time of the actual sonic boom tests. However, these data are also available from the NOAA archival files for Edwards, California, and Yucca Flat and Tonapah, Nevada. These data are included on the electronic files of the present study effort. The NOAA surface-climatological data are provided in hourly intervals and contain temperature, dew point, wind speed and direction, cloud cover and precipitation. This information is provided at that time closest to the sonic boom time.

Sonic Boom Signatures

This section will provide an indication of the quality and character of the measured sonic boom signature traces available on the electronic files. It should be recalled that at the time this information was being acquired and documented in memorandum format, its primary use was relating sonic boom overpressure levels for the large aircraft to the predicted levels that would be associated with the U.S. SST. The XB-70 boom signature results were initially utilized in confirming and improving on the predictive techniques and providing insight into the influence of the atmosphere on signature distortion, especially in terms of shock front rise times as it related to subjective response. Much information remains to be gleaned from the data set; thus, this section will also address signature variability and specify waveform categories and sonic boom signature descriptors that are consistent with those of other sonic boom electronic data bases (refs. 6-10).

Typical oscillograph traces. - An example of the type of sonic boom traces that are included in each of the original memoranda documenting sonic boom test flights is given in figure 9. This example is for XB-70 #2, Flight #7 (DJM File #10) over the Coaldale, Nevada, test site which consisted of the four microphone arrangements as shown in figure 3. Since the B-58 chase aircraft was following behind the XB-70, its boom signature was also recorded at the site some 3.6 seconds later. Because of the large size of the XB-70 and the fact that it is flying at a relatively low Mach number and altitude, the signature measured at ground level is not a simple far-field N-wave (as shown for the B-58) but is a near-field signature containing an intermediate shock. In general, most of the signatures of figure 9 exhibit fairly short shock rise times and reflect little influence of atmospheric effects. Some peaking and rounding of the waveform can be noted on the B-58 signatures from microphones 5 and 7, respectively. The oscillograph copies of the measured boom signatures, typified by the examples shown on figure 9, have been digitized and are included on the electronic files.

Signature variability. - Examples of measured sonic boom signature variability observed with the XB-70 is shown in figure 10. The three signatures illustrated are taken from one of the ground level microphones, specifically, microphone 4 of XB-70 #1, Flight #33 (DJM File #27), microphone 2 of XB-70 #2, Flight #18 (DJM File #26), and microphone 6 of XB-70 #1, Flight #42 (DJM File #35). A "normal" far-field N-wave with fairly short rise time shock fronts was observed on XB-70 #2, Flight 18, whereas, a "spiked-peaked-rounded" and "rounded" waveform with longer rise time shock fronts were observed on XB-70 #1, Flight #33 and XB-70 #1, Flight #42, respectively. Such a wide range of signature variation brought about by the atmosphere, was not, at the time these tests were being conducted, totally unexpected and had been observed in earlier flight tests (refs. 10 and 17).

Waveform categories. - In previous sonic boom flight test programs, a set of waveform categories has been established to reflect the character of the boom signature observed. These same ten waveform categories, illustrated in figure 11, are used to catalogue the signatures of the present report. In addition to the ten wave shapes, word descriptions are also given to each of the categories by means of a single, two, or three letter designation; for instance, a type "NP" was judged to be intermediate between a type "N" normal N-waveform and a type "P" peaked waveform. An "SPR" is a "spiked-peaked-rounded" signature. Such designators are included on both the hard copy listings contained in this report and on the associated electronic files.

Signature descriptors. - The key parameters associated with the measured sonic boom signatures are illustrated in figure 12 and include the positive pressure Δp, positive impulse I_{pos}, duration of the positive phase of the signature Δt_{pos}, total duration of the waveform ΔT, and bow shock wave rise time τ (readings at 1/2, 3/4, and ΔP_{max}). Each of these quantities, along with the waveform category are listed in Table III of this report and on the associated electronic files.

SCANNING AND DIGITIZING METHODS

The information presented in this section is intended to provide a description of the scanning and digitizing methods which were utilized in converting the oscillograph record data contained in the original memorandum documentation of the sonic boom runs. Descriptions relate to the boom traces (such as shown in fig. 9), radar ground tracks of aircraft position (such as those shown in fig. 5), aircraft operating parameters from the onboard data system (such as those shown on fig. 6), and the atmospheric data (such as those shown in fig.8).

Sonic Boom Signatures

Earlier in this report it was noted that the oscillograph traces of the measured sonic boom signatures were recorded with a system having a flat frequency response of 0.01 Hz to 5 KHz; thus, in order to maintain the same fidelity for the electronic files, a digitizing equivalence of about 10 KHz is required. Since the hard copies of the original oscillograph signature traces were already established and optical scanners have an upper limit on scanning rate and also length, a manipulation of the hard copy traces was required. In addition, since some of the oscillograph copy signature traces were quite light in contrast to the background, some "hand- drawn" enhancement of the signatures was done at the time of the original memorandum preparation, especially regarding the shock front where the galvanometer is required to respond to the rapid change in pressure. These relatively few "smoothing" exercises were found to have little effect on the electronic reproduction, particularly on the shock rise times, because of the manner in which the optical scanning was accomplished.

Record preparation. - The overall length of the XB-70 sonic boom signature traces provided in the copies of the oscillograph records varied from about 2.0 inches to about 5.0 inches and represented time durations of from about 200 ms to 350 ms, depending upon the aircraft flight altitude and Mach number. An optical scanner having a scanning rate of 300 readings per inch over a 10 inch length was used; thus, for an original record length of about 4.06 inches, representing a time duration of the boom signature of 0.296 seconds (see fig. 13), a digitizing rate of about 4115 Hz is available. This, of course, is less than half the 10,000 Hz rate required to maintain the 5 KHz frequency response. In order to approach the desired 10 KHz digitizing rate, the oscillograph trace was enlarged by a factor of slightly greater than 2.0, as shown in figure 13, to about 8.90 inches in length. Thus, scanning the expanded signature of duration 0.296 seconds at 300 readings per inch results in a digitizing rate of about 9020 Hz. The combination of variations in total length of the original signatures and scanner limits did not permit reproduction of all the traces to the 5 KHz upper limit, rather their upper frequency falls between 4 KHz and 5 KHz.

Optical scanner. - The nature of operation of the optical scanner can be discussed with the aid of figure 14 which presents, once again, the expanded sonic boom signature of figure 13. Since the scanner is set to read downward while moving from left to right, the signature of figure 14 had to be "cleaned up." The ambient pressure line and time tick marks, beyond the point at which the pressure trace goes negative, must be removed; so, also, must any blemish on the record that will block the scanners view of the sonic boom signature trace. It was mentioned earlier that some of the oscillograph signature traces had "drop outs" or were "enhanced" by hand to provide a more defined trace, especially at shock fronts. The "gaps" in the signatures (for example on the expansion portion of the signature following the bow shock) are filled in prior to scanning. Since the scanner reads vertically downward, the few "enhanced hand drawn" shock fronts will not be read as having negative rise time. A comparison of the original sonic boom signature of figure 13 to the digitized version is shown in figure 15. It can be seen that the scanning/digitizing process provides a very good reproduction of the original boom trace. A comparison of all eight (8) original signatures acquired on the XB-70 #1, Flight #7 (DJM File #1), with those reproduced by the scanning and digitizing process, is given in figure 16. The digitized signatures compare very well with copies of the original traces.

Signature Spectra

Since all of the original hard copies of sonic boom signatures have been digitized, it is now possible to obtain a noise spectrum for each also to be placed on the electronic files. In figure 17 is presented a spectrum of the digitized sonic boom signature from microphone #1 of XB-70 #2, Flight #21 (DJM File #16). Also shown in the lower left corner of the figure is a copy of the boom waveform.

In order to provide a baseline for comparison, the spectrum of an ideal N-wave having the same overpressure and period as the signature given in figure 17 has been plotted in figure 18. Also shown in the lower left corner of the figure is a sketch of the N-wave that was analyzed. The information on the N-wave spectrum is also provided on the electronic files.

The majority of the sonic boom signatures were scanned from a point beginning with the onset of the bow shock and were terminated after the pressure trace returned to the ambient level following the tail shock recompression. In a few cases, however, scanning was terminated prior to the time that the boom pressure trace returned to ambient pressure. In so doing, a "step" was introduced into the digitizing process and this "step" cutoff would appear as a "shock" in the spectrum analysis and might result in the enhancement of high frequencies. The effect of this abrupt termination of the pressure time history is illustrated in figure 19. In the upper left portion of the figure is presented the digitized signature for microphone #6 of XB-70 #1, Flight #40 (DJM File #33). Note that the signature has been terminated about 50 ms after passage of the tail shock (overpressure is about 10% of the maximum bow shock level) and is indicated by the vertical "dotted" line. The spectrum associated with this signature is given in the upper right portion of the figure. For comparison purposes, this same digitized signature shown in the lower left portion of the figure, is allowed to recover to ambient pressure in a more gradual fashion (noted by the sloping "dotted" line) as would be expected in the actual case. The corresponding spectrum is given in the lower right portion of the figure. To assist in the comparison, a reference line is provided on each of the two spectrum plots. As expected, the abrupt termination results in a very slight increase in spectrum level at frequencies beyond 500 Hz.

Aircraft Ground Tracks

The radar ground track information of the type shown in figure 5 was also scanned and digitized for all the XB-70 sonic boom runs for inclusion in the electronic files. Preparation of the copies of the ground tracks from the original memoranda for scanning purposes were conducted in a manner similar to that used for preparing the boom signatures for reading. Scanning was accomplished at a scale equal to the 2-second timing marks along the complete ground track. The horizontal and vertical scales, along with the other information contained on the hard copy, were added to complete the digitizing. A comparison of the original aircraft ground track information for the XB-70 #1, Flight #7 (DJM File #1) with that produced using the scanning/digitizing method is given in figure 20.

Aircraft Onboard Operational Data

Aircraft operation parameters of the type shown in figure 6, including altitude, Mach number, angle of attack and normal acceleration, have also been scanned and digitized for all XB-70 boom runs and are included on the electronic files. Once again, the original hard copy plots were prepared for scanning and digitizing. For these operating parameters, the maximum scanning rate of 300 readings per second was used for the entire trace, however, the data are plotted at 4-second intervals. A comparison of the original onboard aircraft operating conditions for XB-70 #1, Flight #7 (DJM File #1), with those produced using the scanning/digitizing method are given in figure 21. Note that the digitized traces are not as smooth as the original ones because of the 4-second plotting rate.

Test Site Weather

During the 1965-1966 sonic boom test period, upper air atmospheric information was provided for each test run in the form of a temperature and wind profile. In order to enhance this sonic boom data base in terms of additional weather data, NOAA archival rawinsonde data and surface and climatological data were acquired and these latter data, along with the initial profile data, are included on the electronic file.

Upper air temperature and wind profiles. - The upper air temperature and wind profiles shown in figure 8 were also scanned and digitized for all XB-70 runs. Following the preparation and cleanup of these data plots, a maximum scanning rate of 300 readings per inch was utilized. A comparison of the original temperature and wind profiles associated with XB-70 #1, Flight #7 (DJM File #1), with those produced using the scanning/digitizing method, is given in figure 22. It should be noted the Fahrenheit temperature scale was used on about 40 percent of the original data and the Celsius temperature scale for the remaining 60 percent. The Celsius scale is listed in the current electronic file. Thus, one may note a very slight difference in the two temperature profiles given in figure 22.

Archival upper air data. - The 1200-hours and 2400-hour rawinsonde data acquired from NOAA was in hard copy tabular format with listings of atmospheric pressure, temperature, relative humidity, and wind velocity and direction at about every 50 mb feet of altitude. Each of these atmospheric parameters are hand-entered onto the electronic file in tabular format.

Archival surface-climatological data. - NOAA provides these data in hard copy format for each test site at one-hour intervals throughout the day. The data for the hour closest to the estimated boom times are hand-entered into the electronic files.

DATA FILE FORMAT

There are two types of data file format that documents the results of the sonic boom tests which were accomplished during the March 1965 through May 1966 time period using the XB-70: (1) a hard copy version (the present report), and (2) an electronic file copy which may be requested through the NASA Langley Research Center. The hard copy version, which is the present report, is intended to provide tables listing all the sonic boom signature parameter descriptors for all the flights, and also to describe the XB-70 sonic boom data base and how it has been adapted to an electronic file. Thus, it does not contain complete listings of aircraft ground tracks and operating conditions nor does it provide the atmospheric data. The electronic file, on the other hand, contains all of the sonic boom signature parameters/descriptors including the digitized signatures and the spectrum of each signature, aircraft tracking and operating conditions, and all of the atmospheric data. Pertinent discussions on each are given below.

Hard Copy Listings

The pertinent information summarizing the 39 XB-70 sonic boom flights of March 1965 through May 1966 are contained in the master data spreadsheet given in Table IV. Included in the table is a grouping of information for each flight (which is identified by a designated DJM file number) regarding the XB-70 test aircraft, chase aircraft, measurement sites, microphone arrangements, and type sonic boom signature (near-field or far-field). Table IV is intended as a central location of key information contained in Table II: the radar ground tracks, onboard operating conditions, measurement sites, and microphone arrays. This information, in combination with the listings in Table III which provides a summary of XB-70 sonic boom signature characteristics and corresponding aircraft operating conditions, should provide a fairly complete picture of this sonic boom data base, in particular, to users of the electronic data base. The format and listings in Table III are similar to the XB-70 data from Phases I and II of the National Sonic Boom Program conducted at Edwards AFB during the June 1966 through January 1967 time period and reported in references 6 and 7.

Electronic File

The XB-70 electronic database disk guide for the sonic boom flights of March 1965 through May 1966 are given in Table V. Each of the diskettes are organized by a DJM file number and the first listings shown in the table describes the information found on each set of file disks. Following this initial listing is a breakdown of the file names used and a description of the file formats. Included in the latter listing is an indication of approximate number of lines in each of the files (as many as about 2000 to 4000 lines for the signatures to as few as 20 to 30 lines for one onboard aircraft parameter). Note also that the electronic files contain the digitized sonic boom signature, signature spectra, and singnature characteristics corresponding to the B-58, F-4, and T-38 aircraft that were involved as chase aircraft on 10 of the 43 XB-70 sonic boom passes.

CONCLUDING REMARKS

This paper provides a summary of measured sonic boom signature data derived from 39 supersonic flights (43 sonic boom passes) of the XB-70 airplane over a Mach number range of about 1.11 to 2.92 and an altitude range of from 30,500 feet to 70,300 feet. These tables represent a convenient hard copy version of available electronic files which include over 300 digitized sonic boom signatures with their corresponding spectra. Also included on the electronic file is information regarding ground track position aircraft operating conditions and surface and upper air weather observations for each of the 43 sonic boom passes.

In addition to the sonic boom signature data, this paper also provides a description of the XB-70 data base that has been placed on electronic file along with a description of the method used to scan and digitize the analog/oscillograph sonic boom signature time histories. Such information is intended to enhance the value and utilization of the electronic files.

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TABLE I - SUMMARY OF ALL XB-70 FLIGHTS

	NO.	DATE	FLIGHT NO.	PILOT/COPILOT	MACH - MPH	ALT(ft)	HR MIN
	1	9-21-64	1-1	White/Cotton	0.50 - 360	16,000	1 07
	2	10-5-64	1-2	White/Cotton	0.85 - 600	28,000	0 55
	3	10-12-64	1-3	White/Cotton	1.11 - 725	35,400	1 35
	4	10-24-64	1-4	White/Cotton	1.42 - 945	46,300	1 25
	5	2-16-65	1-5	White/Cotton	1.60 - 1060	45,000	1 10
	6	2-25-65	1-6	White/Fulton	0.97 - 655	35,000	0 53
●	7	3-4-65	1-7	White/Fulton	1.85 - 1200	50,200	1 37
	8	3-24-65	1-8	White/Shepard	2.14 - 1365	56,100	1 40
	9	4-2-65	1-9	White/Cotton	0.95 - 630	34,500	0 54
●	10	4-20-65	1-10	White/Cotton	2.30 - 1485	58,500	1 42
	11	4-28-65	1-11	White/Shepard	2.45 - 1570	64,300	1 43
	12	5-7-65	1-12	White/Fulton	2.60 - 1690	65,000	1 25
	13	6-16-65	1-13	White/Cotton	2.60 - 1700	65,000	1 37
●	14	7-1-65	1-14	White/Shepard	2.85 - 1900	68,000	1 44
	15	7-17-65	2-1	White/Cotton	1.41 - 935	42,000	1 13
●	16	7-27-65	1-15	White/Fulton	2.82 - 1900	66,000	1 43
●	17	8-10-65	2-2	Cotton/White	1.45 - 950	41,000	1 27
●	18	8-18-65	2-3	Shepard/White	1.45 - 950	46,000	1 56
●	19	8-20-65	2-4	Fulton/White	1.44 - 950	42,000	2 04
	20	9-17-65	2-5	White/Fulton	1.83 - 1200	50,500	1 55
●	21	9-22-65	1-16	White/Cotton	2.83 - 1900	67,000	1 57
●	22	9-29-65	2-6	White/Shepard	2.23 - 1460	54,000	1 44
●	23	10-5-65	2-7	White/Shepard	2.30 - 1520	55,000	1 40
●	24	10-11-65	2-8	White/Shepard	2.34 - 1550	57,500	1 55
●	25	10-14-65	1-17	White/Cotton	3.02 - 2000	70,000	1 47
●	26	10-16-65	2-9	White/Fulton	2.43 - 1600	59,500	1 43
	27	10-26-65	2-10	White/Fulton	2.46 - 1620	59,000	2 07
●	28	11-2-65	2-11	White/Cotton	2.45 - 1610	59,000	1 54
●	29	11-4-65	1-18	Fulton/White	1.86 -	46,000	2 04
	30	11-8-65	1-19	Cotton/White	1.89 -	45,500	2 23
	31	11-12-65	1-20	Shepard/White	1.84 -	46,000	2 25
●	32	11-18-65	1-21	Cotton/Shepard	1.88 -	47,000	2 02
	33	11-29-65	2-12	White/Fulton	0.53 - 370	15,200	2 19
●	34	11-30-65	1-22	Fulton/White	2.34 -	55,000	1 59
●	35	12-1-65	2-13	White/Fulton	2.67 - 1765	64,000	2 02
●	36	12-2-65	1-23	Cotton/White	2.46 - 1620	60,000	1 51
●	37	12-3-65	2-14	White/Cotton	2.87 - 1900	69,000	1 55
	38	12-7-65	1-24	Shepard/Fulton	2.45 - 1600	62,000	2 26
●	39	12-10-65	1-25	Fulton/Shepard	1.82 - 1200	50,700	2 18
●	40	12-11-65	2-15	White/Shepard	2.94 - 1940	70,600	2 03
	41	12-14-65	1-26	Shepard/Fulton	0.95 -	20,000	2 10
	42	12-20-65	1-27	Cotton/White	1.78 - 1190	42,000	1 58
●	43	12-21-65	2-16	White/Cotton	2.95 - 1945	72,000	1 49
	44	12-22-65	1-28	Shepard/Cotton	1.42 - 950	34,000	2 35
●	45	1-3-66	2-17	White/Cotton	3.05 - 2010	72,000	1 52
	46	1-3-66	1-29	Fulton/Shepard	0.94 - 655	26,000	2 41
	47	1-6-66	1-30	Shepard/Fulton	0.94 - 655	33,000	3 40
●	48	1-11-66	1-31	Fulton/Shepard	1.85 - 1220	46,000	1 35
	49	1-11-66	1-32	Cotton/White	0.95 -	27,000	0 58
●	50	1-12-66	2-18	White/Cotton	3.06 - 2020	72,000	1 48
●	51	1-15-66	1-33	Fulton/White	1.85 - 1220	47,000	1 27
	52	2-7-66	2-19	Shepard/Cotton	1.44 - 960	42,000	2 11
	53	2-9-66	2-20	White/Cotton	3.04 - 2000	70,800	1 49
	54	2-16-66	2-21	White/Cotton	1.10 - 720	32,000	3 06
	55	2-17-66	2-22	White/Cotton	3.04 - 2000	73,000	1 47
	56	2-26-66	1-34	Shepard/Fulton	0.92 - 650	20,000	2 22
	57	3-3-66	1-35	Fulton/Shepard	0.55 -	15,000	2 42
●	58	3-4-66	1-36	Fulton/Shepard	2.02 - 1330	56,000	2 27
●	59	3-7-66	1-37	Shepard/Cotton	2.22 - 1450	57,000	2 19
	60	3-10-66	2-23	White/Fulton	2.76 - 1820	67,000	1 51
●	61	3-15-66	2-24	White/Fulton	2.85 - 1880	69,500	1 59
●	62	3-17-66	2-25	Fulton/White	2.85 - 1880	70,[illegible]	1 52
●	63	3-19-66	2-26	White/Shepard	2.93 - 1930	74,000	1 57
	64	3-23-66	1-38	Cotton/Shepard	0.97 -	32,000	2 11
	65	3-24-66	2-27	Fulton/White	2.71 - 1600	64,000	1 32
	66	3-24-66	1-39	Shepard/Cotton	2.42 - 1600	60,000	2 00
	67	3-26-66	2-28	Cotton/White	0.94 -	36,000	3 09
●	68	3-28-66	1-40	Shepard/Cotton	2.43 - 1600	65,000	1 41
●	69	3-29-66	2-29	Shepard/White	1.65 - 1090	48,000	1 51
	70	3-31-66	2-30	Shepard/White	2.95 - 1950	72,000	2 10
	71	4-1-66	1-41	White/Fulton	-		2 07
	72	4-4-66	2-31	Cotton/White	2.95 - 1940	73,000	1 57
●	73	4-5-66	1-42	Fulton/Shepard	-		2 01
	74	4-8-66	2-32	Fulton/White	3.07 - 2000	73,000	2 05
	75	4-12-66	2-33	White/Cotton	3.08 - 2000	72,800	1 49
	76	4-13-66	1-43	Shepard/Cotton	-		2 03
	77	4-16-66	2-34	White/Cotton	3.03 - 2000	71,000	2 01
	78	4-19-66	1-44	Sheperd/Fulton	-		2 12
●	79	4-21-66	1-45	Shepard/Fulton	2.42 - 1600	61,000	2 02
●	80	4-23-66	2-35	White/Cotton	2.73 - 1800	66,000	2 01
	81	4-25-66	1-46	Fulton/Shepard	2.55 - 1680	63,000	2 07
	82	4-26-66	2-36	Fulton/Cotton	2.65 - 1760	65,500	2 05
	83	4-27-66	1-47	White/Fulton	1.50 - 1010	31,000	2 41
	84	4-30-66	2-37	White/Cotton	-	16,000	2 16
	85	5-3-66	1-48	White/Fulton	-		1 22
	86	5-9-66	1-49	White/Fulton	-		2 16
●	87	5-16-66	2-38	White/Cotton	2.73 - 1800	65,000	2 09
	88	5-19-66	2-39	White/Cotton	3.06 - 2000	72,500	1 59
	89	5-22-66	2-40	Fulton/Cotton	1.51 - 960	36,500	2 22
	90	5-25-66	2-41	Shepard/Cotton	1.63 - 1065	42,000	2 23
●	91	5-27-66	2-42	Shepard/Cotton	2.53 - 1640	62,000	2 08
	92	5-31-66	2-43	Shepard/Fulton	2.25 - 1455	57,000	2 02
■	93	6-4-66	2-44	Shepard/Cotton	2.93 - 1930	70,000	2 05
■	94	6-6-66	2-45	Shepard/Cotton	3.05 - 2000	72,000	2 00
■	95	6-8-66	2-46	White/Cross	1.41 - 940	32,000	2 13
■	96	11-3-66	1-50	Cotton/Fulton	2.10 -	60,000	2 00
■	97	11-10-66	1-51	Fulton/Cotton	2.52 -	60,000	1 39
■	98	11-23-66	1-52	Shepard/Cotton	2.51 -	61,000	1 38
■	99	12-12-66	1-53	Fulton/Shepard	2.52 -	60,000	1 57
■	100	12-14-66	1-54	Shepard/Fulton	2.55 -	60,300	1 54
■	101	12-20-66	1-55	Cotton/Shepard	2.53 -	60,800	1 45
■	102	1-4-67	1-56	Fulton/Shepard	2.53 -	60,400	1 44
■	103	1-13-67	1-57	Cotton/Fulton	2.57 -	61,000	1 46
■	104	1-17-67	1-58	Cotton/Shepard	2.56 -	60,200	1 44
	105	1- -67	1-59	Fulton/Shepard	1.40 -	35,000	1 32
	106	1-31-67	1-60	Fulton/Cotton	1.40 -	37,000	1 32
	107	4-25-67	1-61	Cotton/Fulton	- 265knt	17,000	1 07
	108	5-12-67	1-62	Fulton/Cotton	- 275knt	16,500	2 17
	109	6-2-67	1-63	Cotton/Shepard	1.43 -	42,000	2 23
	110	6-22-67	1-64	Fulton/Mallick	1.83 -	54,000	1 [illegible]
	111	8-10-67	1-65	Cotton/Sturmthal	0.92 -	15,500	2 27
	112	8-24-67	1-66	Fulton/Mallick	2.24 -	57,700	1 52
	113	9-8-67	1-67	Cotton/Sturmthal	2.3 -	61,000	1 50
	114	10-11-67	1-68	Fulton/Mallick	2.43 -	58,000	1 39
	115	11-2-67	1-69	Cotton/Sturmthal	2.55 -	64,000	1 56
	116	1-12-68	1-70	Fulton/Mallick	2.55 -	67,000	1 54
	117	2-13-68	1-71	Mallick/Cotton	1.18 -	41,000	2 43
	118	2-28-68	1-72	Fulton/Sturmthal	- 255knt	18,500	1 51
	119	3-21-68	1-73	Cotton/Fulton	- 270knt	15,500	2 32
	120	6-11-68	1-74	Mallick/Fulton	-		1 09
	121	6-28-68	1-75	Sturmthal/Cotton	-		2 37
	122	7-19-68	1-76	Mallick/Fulton	-		1 53
	123	8-16-68	1-77	Fulton/Sturmthal	2.47 -	63,000	1 55
	124	9-10-68	1-78	Mallick/Fulton	-		1 45
	125	10-18-68	1-79	Fulton/Sturmthal	2.18 -	52,000	1 53
	126	11-1-68	1-80	Sturmthal/Fulton	-		2 06
	127	12-3-68	1-81	Mallick/Fulton	-		1 58
	128	12-17-68	1-82	Fulton/Sturmthal	-		2 42
	129	2-4-69	1-83	Fulton/Sturmthal	-		

● - denotes sonic boom measurements (39 flights - 43 sonic boom passes) - current task

■ - denotes sonic boom measurements (12 flights - 19 sonic boom passes) - on existing NASA LaRC electronic files

TABLE II - XB-70 SONIC BOOM LOG

(for flights of March 4, 1965 through May 27, 1966)

DJM File#	Date	A/C#-Flt #	T/O Time	T/O Gr.Wt.	Flt. Time	Boom Time	Boom Mach	Boom Alt	Boom Gr.Wt.	Land Gr.Wt.
1	3-4-65	1-7	1018	480K	1:37	1114	1.83	50500	337K	297K
2	4-20-65	1-10	1113	510K	1:42	1213	1.80	48000	350K	300K
3	7-1-65	1-14	0650	510K	1:44	0800	2.60	66000	310K	285K
4	7-27-65	1-15	0707	510K	1:43	0732	1.23	32000	423K	300K
5	8-10-65	2-2	0700	470K	1:27	0740	1.38	42300	357K	310K
6	8-18-65	2-3	1220	490K	1:58	1330	1.40	46000	381K	305K
7	8-20-65	2-4	1115	493K	2:04	1159	1.42	42500	387K	295K
8	9-22-65	1-16	1200	510K	1:57	1225	1.50	33800	456K	300K
9	9-29-65	2-6	1147	495K	2:04	1220	1.35	33000	440K	295K
10	10-5-65	2-7	1213	495K	1:40	1243	1.42	31000	438K	295K
11	10-11-65	2-8	1310	515K	1:55	1332	1.51	34000	423K	298K
12	10-14-65	1-17	0906	510K	1:47	0936	1.76	41000	433K	300K
13	10-16-65	2-9	0912	520K	1:43	1027	1.40	50000	313K	295K
14	11-2-65	2-11	1126	520K	1:54	1255	1.80	50500	317K	295K
15	11-4-65	1-18	1019	515K	2:04	1105	1.87	41500	357K	300K
16	11-18-65	1-21	1233	515K	2:02	1338	1.61	41500	348K	300K
17	11-30-65	1-22	0900	515K	1:59	1010	1.82	53000	325K	295K
18	12-1-65	2=13	0902	525K	2:02	1030	2.31	60000	328K	297K
19	12-2-65	1-23	0915	515K	1:59	1040	1.79	54000	317K	300K
20	12-3-65	2-14	0906	520K	1:55	1030	2.48	65500	329K	300K
21	12-10-65	1-25	1230	515K	2:18	1315	1.55	30500	436K	--
			(2nd	run)	----	1400	1.25	38000	371K	295K
22	12-11-65	2-15	0858	520K	2:03	0918	1.50	37000	454K	--
			(2nd	run)	----	1028	2.90	70000	321K	300K
23	12-21-65	2-16	1307	510K	1:49	1427	2.92	70000	321K	300K
24	1-3-66	2-17	0901	520K	1:52	1020	2.91	69800	317K	295K
25	1-11-66	1-31	0702	447K	1:35	0750	1.80	44900	369K	295K
26	1-12-66	2-18	0855	525K	1:48	1018	2.05	66000	297K	290K
27	1-15-66	1-33	1108	450K	1:27	1153	1.78	45100	373K	290K
28	3-4-66	1-36	1055	523K	2:27	1140	1.75	41000	446K	--
		(2nd station-same run)			----	1140	1.82	42000	445K	293K
29	3-7-66	1-37	1402	520K	2:19	1532	1.17	41000	344K	--
		(2nd station-same run)			----	1532	1.17	40000	343K	295K
30	3-15-66	2-24	0909	535K	1:59	1030	2.66	68500	310K	--
		(2nd station-same run)			----	1030	2.66	69300	310K	293K
31	3-17-66	2-25	0847	535K	1:52	1015	2.74	66000	308K	--
		(2nd station-same run)			----	1015	2.74	66000	308K	297K
32	3-19-66	2-26	1040	530K	1:57	1210	2.84	70300	305K	--
		(2nd station-same run)			----	1210	2.84	70300	304K	291K
33	3-28-66	1-40	0950	520K	1:41	1053	1.80	51000	319K	--
		(2nd station-same run)			----	1053	1.80	51000	319K	300K
34	3-29-66	2-29	1027	530K	1:51	1137	1.56	44000	314K	--
		(2nd station-same run)			----	1137	1.56	44000	314K	--
		---------------(2nd run)			----	1152	1.36	36400	304K	--
		(2nd station-2nd run)			----	1152	1.36	36400	304K	300K
35	4-5-66	1-42	1026	520K	2:01	1138	1.55	52000	334K	295K
36	4-21-66	1-45	1539	524K	2:02	1646	2.26	53000	338K	290K
37	4-23-66	2-35	1120	525K	2:01	1140	1.11	32000	468K	--
		(2nd station-same run)			----	1140	1.18	32000	467K	--
		---------------(2nd run)			----	1255	2.20	64000	362K	--
		(2nd station-2nd run)			----	1255	2.20	64000	362K	310K
38	5-16-66	2-38	0900	520K	2:09	1019	1.30	44300	321K	300K
39	5-27-66	2-42	1100	520K	2:08	1240	1.24	39800	310K	300K

Total number of sonic boom flights = 39

Total number of sonic boom passes = 43

TABLE III - SUMMARY OF XB-70 SONIC BOOM SIGNATURE CHARACTERISTICS AND CORRESPONDING AIRCRAFT OPERATING CONDITIONS.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/ sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
1	1-7	3-4-65	50500	1.83	337000	204	1114	3.56 R	1	0.92	**	**	**	**	**	**	*	F
									2	1.60	0.1368	0.2546	0.0886	0.0057	0.0017	0.0010	PR	
									3	1.75	0.1377	0.2531	0.1005	0.0044	0.0010	0.0009	N	
									4	1.71	0.1402	0.2565	0.1029	0.0073	0.0020	0.0014	PR	
									5	0.80	**	**	**	**	**	**	*	F
									6	2.10	0.1536	0.2555	0.1356	0.0083	0.0033	0.0018	NR	
									7	1.20	0.1418	0.2574	0.0718	0.0191	0.0039	0.0027	NR	
									8	1.79	0.1439	0.2621	0.1061	0.0059	0.0026	0.0013	P	
2	1-10	4-20-65	48000	1.8	350000	254	1213	0	1	3.55	0.1318	0.2536	0.1942	0.0077	0.0061	0.0024	P	
									2	3.70	0.1356	0.2516	0.2031	0.0064	0.0044	0.0018	P	
									3	3.05	0.1370	0.2528	0.1566	0.0100	0.0021	0.0017	PP	
									4	4.15	0.1397	0.2517	0.2120	0.0091	0.0045	0.0033	PP	
									5	4.25	0.1363	0.2534	0.1994	0.0119	0.0085	0.0031	PP	
									6	2.13	**	**	**	**	**	**	*	F
									7	3.48	0.1370	0.2508	0.2023	0.0043	0.0035	0.0029	P	
									8	2.25	**	**	**	**	**	**	*	F
3	1-14	7-1-65	66000	2.6	310000	296	0800	0.5 L	1	1.47	0.1656	0.2704	0.1442	0.0066	0.0019	0.0006	NR	
									2	1.63	0.1682	0.2704	0.1516	0.0068	0.0017	0.0004	NR	
									3	1.69	0.1567	0.2721	0.1409	0.0092	0.0039	0.0004	NR	
									4	0.88	**	**	**	**	**	**	*	F
								6.1 R	5	1.25	0.1517	0.2660	0.0942	0.0038	0.0015	0.0010	N	
									6	1.75	0.1600	0.2653	0.1329	0.0049	0.0010	0.0009	N	
									7	1.70	0.1526	0.2666	0.1336	0.0070	0.0024	0.0013	NR	
									8	0.90	**	**	**	**	**	**	*	F
4	1-15	7-27-65	32000	1.23	423000	017	0732	0.99 L	1	2.85	0.1586	0.2334	0.2723	0.0586	0.0020	0.0006	N	
									2	1.30	**	**	**	**	**	**	*	F
									3	3.15	0.1390	0.2218	0.2480	0.0515	0.0003	0.0003	N	
									4	2.75	0.1483	0.2308	0.2332	0.0555	0.0031	0.0002	N	
									5	2.05	0.1441	0.2279	0.1942	0.0628	0.0042	0.0004	NR	
									6	1.10	**	**	**	**	**	**	*	F
									7	2.37	0.1511	0.2310	0.2154	0.0655	0.0075	0.0030	NR	
									8	2.30	0.1510	0.2296	0.2077	0.0604	0.0044	0.0031	NR	
5	2-2	8-10-65	42300	1.38	357000	171	0740	5.0 L	5	2.15	0.1451	0.2503	0.1769	0.0045	0.0026	0.0017	N	
									6	0.95	**	**	**	**	**	**	*	F
									7	2.18	0.1451	0.2509	0.1837	0.0025	0.0004	0.0003	N	
									8	2.00	0.1443	0.2496	0.1769	0.0351	0.0006	0.0003	NR	

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/ sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
6	2-3	8-18-65	46000	1.4	381000	184	1330	15.0 L	1	0.32	0.2593	0.2897	0.0505	0.0527	0.0405	0.0296	CO	
									2	0.30	0.2325	0.2650	0.0408	0.1071	0.0407	0.0290	CO	
7	2-4	8-20-65	42500	1.42	387000	151	1159	2.5 L	1	2.13	0.1315	0.2447	0.1458	0.0125	0.0090	0.0052	R	
									2	0.98	**	**	**	**	**	**	*	F
									3	2.15	0.1384	0.2414	0.1638	0.0143	0.0054	0.0043	R	
									4	2.08	0.1390	0.2409	0.1639	0.0315	0.0069	0.0050	R	
								7.0 L	5	1.33	0.1629	0.2389	0.1294	0.0762	0.0411	0.0095	R	
									6	0.72	**	**	**	**	**	**	*	F
									7	1.42	0.1660	0.2418	0.1346	0.0655	0.0210	0.0184	R	
									8	1.27	0.1659	0.2409	0.1409	0.0664	0.0249	0.0104	R	
8	1-16	9-22-65	33800	1.5	456000	007	1225	1.56 R	5	2.81	0.1245	0.1966	0.2180	0.0373	0.0024	0.0022	NR	
									6	1.58	**	**	**	**	**	**	*	F
									7	3.05	0.1267	0.1949	0.2330	0.0144	0.0037	0.0015	NR	
									8	3.28	0.1245	0.1961	0.2340	0.0053	0.0021	0.0017	NR	
9	2-6	9-29-65	33000	1.35	439900	001	1220	0.66 L	5	2.59	0.1926	0.2671	0.3232	0.0612	0.0215	0.0106	R	
									6	1.24	**	**	**	**	**	**	*	F
									7	2.41	0.1832	0.2519	0.2737	0.0590	0.0459	0.0103	R	
									8	2.44	0.1880	0.2477	0.2798	0.0641	0.0223	0.0114	R	
10	2-7	10-5-65	31000	1.42	437900	359	1243	0.74 R	5	2.99	0.1460	0.2199	0.2508	0.0097	0.0043	0.0037	NR	
									6	2.35	**	**	**	**	**	**	*	F
									7	3.90	0.1259	0.2105	0.2626	0.0065	0.0022	0.0020	NP	
									8	4.27	0.1316	0.2082	0.2877	0.0012	0.0005	0.0004	NP	
11	2-8	10-11-65	34000	1.51	422900	008	1332	0.08 L	5	2.65	0.1272	0.2084	0.2046	0.0068	0.0015	0.0011	PP	
									6	1.50	**	**	**	**	**	**	*	F
									7	3.90	0.1306	0.2060	0.2229	0.0019	0.0016	0.0011	SP	
									8	4.10	0.1338	0.2034	0.2171	0.0011	0.0007	0.0006	SP	
12	1-17	10-14-65	41000	1.76	433000	010	0936	2.14 L	5	3.14	0.1256	0.2034	0.1986	0.0077	0.0033	0.0024	NP	
									6	1.60	**	**	**	**	**	**	*	F
									7	3.13	0.1208	0.2031	0.1924	0.0068	0.0024	0.0018	NP	
									8	3.36	0.1217	0.2015	0.2038	0.0113	0.0014	0.0009	NP	
13	2-9	10-16-65	50000	1.4	313000	307	1027	9.88 L	1	0.30	0.1534	0.3730	0.0277	0.0972	0.0778	0.0101	CO	
									2	0.31	0.1883	0.3166	0.0291	0.0937	0.0201	0.0134	CO	
									3	0.30	0.2168	0.3831	0.0315	0.0966	0.0158	0.0116	CO	
									4	0.32	0.2174	0.3931	0.0351	0.0997	0.0679	0.0199	CO	
									5	0.26	0.2280	0.3376	0.0300	0.1210	0.0787	0.0321	CO	
									6	0.20	**	**	**	**	**	**	*	F
									7	0.22	0.1256	0.3407	0.0160	0.0785	0.0145	0.0068	CO	
									8	0.20	**	**	**	**	**	**	*	F

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
14	2-11	11-2-65	50500	1.8	317000	289	1255	5.68 R	5	2.10	0.1530	0.2419	0.1493	0.0082	0.0048	0.0047	NP	
									6	0.90	**	**	**	**	**	**	*	F
									7	1.95	0.1328	0.2384	0.1249	0.0022	0.0018	0.0004	NP	
15	1-18	11-4-65	41500	1.87	347800	274	1105	5.35 R	5	1.00	0.1474	0.2439	0.0896	0.0263	0.0026	0.0021	NP	
									6	0.59	**	**	**	**	**	**	*	F
									7	1.00	0.1417	0.2400	0.0831	0.0153	0.0041	0.0023	NP	
									8	1.00	0.1378	0.2378	0.0757	0.0038	0.0032	0.0023	NP	
16	1-21	11-18-65	41500	1.61	357300	322	1338	2.14 R	1	2.97	0.1262	0.2257	0.1898	0.0012	0.0006	0.0006	NP	
									2	2.53	0.1279	0.2230	0.1848	0.0277	0.0047	0.0017	NR	
									3	2.75	0.1234	0.2248	0.1887	0.0291	0.0027	0.0020	NP	
									4	2.80	0.1338	0.2277	0.2025	0.0292	0.0036	0.0030	NP	
									5	3.03	0.1384	0.2377	0.2082	0.0336	0.0100	0.0073	NP	
									6	1.84	**	**	**	**	**	**	*	F
									7	2.47	0.1260	0.2271	0.1844	0.0281	0.0031	0.0026	NR	
									8	1.13	**	**	**	**	**	**	*	F
17	1-22	11-30-65	53000	1.82	325500	276	1010	10.4 L	1	1.27	0.1445	0.2413	0.0979	0.0096	0.0053	0.0046	NR	
									2	1.20	0.1439	0.2357	0.0921	0.0078	0.0024	0.0018	NR	
									3	1.35	0.1436	0.2219	0.0973	0.0130	0.0028	0.0027	NR	
									4	1.40	0.1412	0.2308	0.0951	0.0062	0.0036	0.0021	NR	
									5	1.24	0.1464	0.2388	0.0943	0.0106	0.0048	0.0043	NR	
									6	0.63	**	**	**	**	**	**	*	F
									7	1.25	0.1400	0.2463	0.0866	0.0066	0.0041	0.0026	NR	
									8	0.53	**	**	**	**	**	**	*	F
18	2-13	12-1-65	60000	2.31	328000	289	1030	4.86 R	1	1.80	0.1579	0.2800	0.1409	0.0133	0.0005	0.0004		
									2	1.94	0.1683	0.2873	0.1662	0.0077	0.0012	0.0011		
									3	2.35	0.1594	0.2737	0.1866	0.0055	0.0002	0.0001		
									4	2.25	0.1613	0.2792	0.1801	0.0064	0.0033	0.0013	NP	
									5	1.74	0.1562	0.2521	0.1335	0.0094	0.0028	0.0008		
									6	0.90	**	**	**	**	**	**	*	F
									7	1.75	0.1490	0.2831	0.1246	0.0064	0.0024	0.0018		
									8	0.94	**	**	**	**	**	**	*	F
19	1-23	12-2-65	54000	1.79	317200	254	1040	5.93 R	1	1.88	0.1561	0.2768	0.1351	0.0056	0.0018	0.0013	N	
									2	1.87	0.1684	0.2807	0.1412	0.0085	0.0034	0.0011	NR	
									3	1.80	0.1626	0.2774	0.1361	0.0079	0.0022	0.0007	PP	
									4	1.88	0.1617	0.2774	0.1453	0.0127	0.0020	0.0008	NR	
									5	1.72	0.1601	0.2817	0.1269	0.0135	0.0009	0.0001	NR	
									6	0.87	**	**	**	**	**	**	*	F
									7	1.85	0.1517	0.2810	0.1187	0.0063	0.0035	0.0005	NP	
									8	0.85	**	**	**	**	**	**	*	F

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/ sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
20	2-14	12-3-65	65500	2.48	329500	276	1030	0.06 R	1	1.94	0.1679	0.3148	0.1674	0.0068	0.0036	0.0016	NR	
									2	1.97	0.1708	0.3124	0.1772	0.0146	0.0010	0.0001	NP	
									3	1.90	0.1701	0.3147	0.1700	0.0146	0.0011	0.0002	PR	
									4	1.99	0.1728	0.3140	0.1856	0.0090	0.0038	0.0024	N	
									5	1.65	0.1757	0.3214	0.1535	0.0101	0.0044	0.0030	N	
									6	0.97	**	**	**	**	**	**	*	F
									7	1.80	0.1680	0.3177	0.1510	0.0107	0.0015	0.0010	PP	
									8	1.04	**	**	**	**	**	**	*	F
21	1-25	12-10-65	30500	1.55	436329	332	1315	2.32 R	5	3.15	0.1428	0.2094	0.2658	0.0019	0.0005	0.0005	PR	
									6	1.63	**	**	**	**	**	**	*	F
									7	3.58	0.1306	0.2113	0.2526	0.0257	0.0019	0.0014	P	
									8	3.19	0.1404	0.2102	0.2669	0.0330	0.0064	0.0025	R	
			38000	1.25	371229	163	1400	9.48 L	5	3.18	0.1571	0.2660	0.2893	0.0594	0.0038	0.0038	PR	
									6	0.97	**	**	**	**	**	**	*	F
									7	3.01	0.1392	0.2606	0.2486	0.0604	0.0038	0.0022	NP	
									8	2.81	0.1549	0.2648	0.2572	0.0626	0.0403	0.0340	PR	
22	2-15	12-11-65	37000	1.5	453645	003	0918	1.40 L	1	1.55	0.1695	0.3037	0.1011	0.0042	0.0031	0.0021	SP	
									2	0.84	**	**	**	**	**	**	*	F
									3	1.75	0.1735	0.2997	0.1421	0.0101	0.0059	0.0037	NP	
									4	1.84	0.1787	0.3039	0.1509	0.0105	0.0070	0.0061	NP	
			70000	2.9	320625	298	1028	5.23 R	5	3.00	0.1347	0.2252	0.2382	0.0097	0.0018	0.0015	NR	
									6	1.55	**	**	**	**	**	**	*	F
									7	3.07	0.1347	0.2243	0.2343	0.0048	0.0010	0.0003	NP	
									8	2.95	0.1418	0.2271	0.2618	0.0059	0.0015	0.0012	NR	
23	2-16	12-21-65	70000	2.92	321484	276	1427	1.61 L	1	2.31	0.1901	0.3204	0.1565	0.0119	0.0077	0.0073	P	
									2	2.39	0.1984	0.3150	0.1624	0.0108	0.0080	0.0067	P	
									3	2.40	0.1988	0.3194	0.1704	0.0110	0.0092	0.0086	P	
									4	2.22	0.1843	0.3191	0.1428	0.0084	0.0079	0.0079	P	
24	2-17	1-3-66	69800	2.91	317331	306	1020	7.11 R	6	0.65	**	**	**	**	**	**	*	F
									7	1.26	0.1620	0.2964	0.1017	0.0075	0.0030	0.0020	N	
									8	0.70	**	**	**	**	**	**	*	F
25	1-31	1-11-66	44900	1.8	369179	266	0750	6.83 R	1	2.03	0.1378	0.2062	0.1450	0.0285	0.0083	0.0050	R	
									2	2.01	0.1242	0.2039	0.1411	0.0296	0.0048	0.0018	NR	
									3	2.20	0.1308	0.2071	0.1631	0.0062	0.0045	0.0007	R	
									5	2.06	0.1357	0.2050	0.1534	0.0228	0.0057	0.0027	R	
									6	0.95	**	**	**	**	**	**	*	F
									7	2.00	0.1392	0.2067	0.1433	0.0291	0.0083	0.0058	R	
									8	1.97	0.1248	0.2075	0.1341	0.0194	0.0072	0.0052	NR	

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
26	2-18	1-12-66	66000	2.05	297352	285	1018	2.06 R	1	1.92	0.1868	0.3257	0.1665	0.0073	0.0034	0.0021	N	
									2	2.10	0.1756	0.3227	0.1863	0.0064	0.0007	0.0004	N	
									3	2.14	0.1908	0.3224	0.2028	0.0079	0.0023	0.0014	N	
									4	2.14	0.1785	0.3238	0.1950	0.0091	0.0031	0.0016	N	
									5	1.85	0.1760	0.3234	0.1601	0.0071	0.0028	0.0014	N	
									6	0.97	**	**	**	**	**	**	*	F
									7	1.80	0.1748	0.3262	0.1635	0.0061	0.0018	0.0010	N	
									8	0.95	**	**	**	**	**	**	*	F
27	1-33	1-15-66	45100	1.78	373097	277	1153	7.74 R	1	2.65	0.1303	0.1916	0.1402	0.0176	0.0095	0.0059	R	
									2	4.10	0.1229	0.1854	0.1256	0.0145	0.0129	0.0122	SPR	
									3	3.30	0.1213	0.1941	0.1288	0.0140	0.0118	0.0092	SPR	
									4	3.85	0.1278	0.1942	0.1451	0.0147	0.0131	0.0082	SPR	
									5	2.65	0.1283	0.1982	0.1287	0.0179	0.0109	0.0057	R	
									6	0.80	**	**	**	**	**	**	*	F
									7	3.15	0.1337	0.1962	0.1196	0.0152	0.0125	0.0121	SPR	
									8	0.85	**	**	**	**	**	**	*	F
28	1-36	3-4-66	41000	1.75	445500	295	1140	3.412 L	1	1.55	**	**	**	**	**	**	*	F
									2	3.50	0.1574	0.2569	0.2516	0.0121	0.0084	0.0045	PR	
									3	2.90	0.1601	0.2571	0.2351	0.0333	0.0052	0.0023	R	
									4	3.35	0.1556	0.2566	0.2509	0.0128	0.0063	0.0046	PR	
			42000	1.82		301	1140	0.33 R	5	3.25	0.1466	0.2427	0.2481	0.0257	0.0023	0.0022	PR	
									6	1.81	**	**	**	**	**	**	*	F
									7	3.50	0.1430	0.2433	0.2536	0.0162	0.0037	0.0030	NP	
									8	4.10	0.1386	0.2420	0.2621	0.0159	0.0056	0.0024	NP	
									9	3.50	0.1564	0.2611	0.2776	0.0326	0.0180	0.0091	R	
									10	1.72	**	**	**	**	**	**	*	F
									11	3.95	0.1407	0.2392	0.2574	0.0165	0.0072	0.0021	NR	
									12	3.25	0.1491	0.2443	0.2531	0.0288	0.0051	0.0037	PP	
29	1-37	3-7-66	41000	1.17	343700	283	1532	1.18 L	1	1.75	**	**	**	**	**	**	*	F
									2	3.98	0.2081	0.2974	0.4096	0.0971	0.0527	0.0387	P	
									3	3.86	0.2106	0.2962	0.4104	0.0954	0.0829	0.0357	R	
									4	3.71	0.2051	0.2967	0.3890	0.0927	0.0496	0.0356	P	
			40000				1532	1.84 R	5	3.35	0.1552	0.2660	0.2693	0.0444	0.0231	0.0040	P	
									6	1.39	**	**	**	**	**	**	*	F
									7	3.25	0.1587	0.2665	0.2731	0.0488	0.0078	0.0049	PR	
									8	3.14	0.1579	0.2690	0.2807	0.0397	0.0037	0.0034	NP	
									9	2.94	0.1580	0.2660	0.2664	0.0485	0.0065	0.0030	PP	
									10	1.47	**	**	**	**	**	**	*	F
									11	2.85	0.1522	0.2663	0.2594	0.0430	0.0043	0.0031	PR	
									12	3.57	0.1649	0.2683	0.3131	0.0465	0.0251	0.0058	NR	

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/ sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
30	2-24	3-15-66	68500	2.66	310000	291	1030	0.66 R	1	0.94	**	**	**	**	**	**	*	F
									2	1.84	0.1690	0.2902	0.1624	0.0105	0.0052	0.0021	NR	
									3	1.73	0.1724	0.2879	0.1572	0.0205	0.0023	0.0010	N	
									4	1.89	0.1673	0.2901	0.1585	0.0065	0.0021	0.0015	N	
			69300				1030	3.08 R	5	1.58	0.1647	0.2900	0.1355	0.0059	0.0045	0.0018	NR	
									6	1.64	0.1684	0.2895	0.1367	0.0085	0.0039	0.0029	NR	
									7	1.75	0.1667	0.2901	0.1464	0.0051	0.0031	0.0012	N	
									8	1.87	0.1647	0.2920	0.1656	0.0101	0.0031	0.0023	NR	
									9	1.70	0.1686	0.2904	0.1567	0.0084	0.0040	0.0023	NR	
									10	1.78	0.1660	0.2877	0.1646	0.0229	0.0032	0.0018	NR	
									11	0.94	**	**	**	**	**	**	*	F
									12	0.92	**	**	**	**	**	**	*	F
31	2-25	3-17-66	66000	2.74	308000	295	1015	5.43 R	1	0.98	**	**	**	**	**	**	*	F
									2	1.83	0.1650	0.2729	0.1536	0.0136	0.0006	0.0002	NR	
									3	2.02	0.1629	0.2702	0.1415	0.0066	0.0039	0.0015	NR	
									4	1.74	0.1676	0.2755	0.1496	0.0115	0.0053	0.0022	NR	
							1015	7.41 R	5	1.52	0.1664	0.2837	0.1269	0.0145	0.0023	0.0013	NR	
									6	1.53	0.1674	0.2848	0.1275	0.0229	0.0031	0.0021	NR	
									7	1.65	0.1688	0.2843	0.1361	0.0208	0.0028	0.0017	NR	
									8	1.67	0.1653	0.2863	0.1382	0.0097	0.0016	0.0010	NR	
									12	0.78	**	**	**	**	**	**	*	F
32	2-26	3-19-66	70300	2.84	304500	297	1210	0.54 L	1	1.06	**	**	**	**	**	**	*	F
									2	1.91	0.1801	0.3008	0.1665	0.0134	0.0041	0.0024	NR	
									3	2.25	0.1757	0.3006	0.1636	0.0110	0.0044	0.0018	NR	
									4	2.23	0.1746	0.3021	0.1751	0.0011	0.0006	0.0006	NP	
							1210	1.58 R	5	1.75	0.1619	0.3064	0.1479	0.0087	0.0033	0.0027	NR	
									6	1.67	0.1510	0.3144	0.1411	0.0088	0.0049	0.0042	NR	
									7	1.81	0.1719	0.3023	0.1468	0.0153	0.0049	0.0029	NR	
									8	1.91	0.1845	0.3009	0.1703	0.0181	0.0067	0.0040	NR	
									9	1.66	0.1806	0.3065	0.1747	0.0231	0.0022	0.0006	NR	
									10	1.63	0.1777	0.3059	0.1692	0.0215	0.0021	0.0010	NR	
									11	0.69	**	**	**	**	**	**	*	F
									12	0.71	**	**	**	**	**	**	*	F

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/ sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
33	1-40	3-28-66	51000	1.8	319300	249	1053	0.33 L	1	2.20	**	**	**	**	**	**	*	F
									2	2.90	0.1423	0.2424	0.2100	0.0116	0.0042	0.0028	NP	
									3	3.15	0.1431	0.2462	0.2265	0.0056	0.0038	0.0026	NP	
									4	2.85	0.1440	0.2437	0.2160	0.0073	0.0039	0.0026	NP	
							1053	4.91 R	5	2.05	0.1523	0.2393	0.1269	0.2288	0.0099	0.0014	N	
									6	2.05	0.1503	0.2349	0.1626	0.0044	0.0026	0.0015	PR	
									7	2.10	0.1490	0.2390	0.1629	0.0186	0.0077	0.0073	NR	
									8	2.15	0.1480	0.2347	0.1621	0.0124	0.0021	0.0008	NR	
									9	2.07	0.1506	0.2402	0.1275	0.0900	0.0066	0.0030	PR	
									10	2.10	0.1473	0.2348	0.1420	0.0066	0.0038	0.0027	PR	
									11	0.95	**	**	**	**	**	**	*	F
									12	1.15	**	**	**	**	**	**	*	F
34	2-29	3-29-66	44000	1.56	313800	240	1137	1.98 R 1	1	1.55	**	**	**	**	**	**	*	F
									2	3.10	0.1330	0.2259	0.2351	0.0069	0.0054	0.0028	PR	
									3	3.25	0.1334	0.2278	0.2313	0.0274	0.0168	0.0061	R	
									4	2.65	0.1317	0.2265	0.2070	0.0384	0.0091	0.0045	R	
							1137	7.46 R	5	1.55	0.1477	0.2172	0.1127	0.0167	0.0103	0.0072	R	
									6	1.97	0.1412	0.2215	0.1077	0.0250	0.0209	0.0145	R	
									7	2.10	0.1387	0.2193	0.1264	0.0264	0.0219	0.0138	R	
									8	1.95	0.1269	0.2201	0.1034	0.0204	0.0172	0.0127	R	
									9	2.00	0.1379	0.2186	0.1177	0.0223	0.0177	0.0117	R	
									10	1.90	**	**	**	**	**	**	*	F
									11	2.00	0.1364	0.2138	0.1125	0.0261	0.0213	0.0129	R	
									12	1.82	**	**	**	**	**	**	*	F
			36400	1.36	303700	132	1152	7.74 L 2	1	1.50	**	**	**	**	**	**	*	F
									2	1.65	0.1662	0.2279	0.1418	0.0757	0.0439	0.0257	R	
									3	1.60	0.1685	0.2266	0.1521	0.0693	0.0441	0.0218	R	
									4	1.55	0.1511	0.1512	0.1290	0.0757	0.0448	0.0268	R	
							1152	8.20 L	5	1.40	0.1376	0.2189	0.0849	0.0301	0.0158	0.0130	R	
									6	1.20	0.1538	0.2409	0.0993	0.0301	0.0175	0.0113	R	
									7	1.30	0.1471	0.2346	0.1024	0.0411	0.0166	0.0098	R	
									8	1.35	0.1456	0.2395	0.0949	0.0392	0.0230	0.0131	R	
									9	1.45	0.1502	0.2388	0.1064	0.0416	0.0192	0.0132	R	
									10	1.52	**	**	**	**	**	**	*	F
									11	1.15	0.1569	0.2410	0.0948	0.0446	0.0202	0.0136	R	
									12	1.30	**	**	**	**	**	**	*	F

TABLE III - Continued.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
35	1-42	4-5-66	52000	1.55	333900	273	1138	0.49 L	1	1.15	**	**	**	**	**	**	*	F
									2	1.15	**	**	**	**	**	**	*	F
									3	1.50	**	**	**	**	**	**	*	F
									4	0.85	**	**	**	**	**	**	*	F
									5	2.90	0.1518	0.2842	0.2279	0.0258	0.0075	0.0055	R	
									6	2.80	0.1566	0.2874	0.2374	0.0486	0.0155	0.0074	R	
									7	2.90	0.1574	0.2880	0.2433	0.0424	0.0219	0.0066	R	
									8	2.62	0.1569	0.2899	0.1894	0.0231	0.0113	0.0063	R	
									9	3.20	0.1534	0.2892	0.2557	0.0138	0.0095	0.0054	R	
									10	2.75	0.1479	0.2885	0.2161	0.0469	0.0167	0.0078	R	
									11	2.75	0.1536	0.2889	0.2269	0.0431	0.0222	0.0094	R	
									12	2.80	0.1573	0.2876	0.2110	0.0230	0.0106	0.0057	R	
36	1-45	4-21-66	53000	2.26	337800	260	1646	4.82 L	5	1.90	0.1655	0.2557	0.1741	0.0312	0.0098	0.0068	R	
									6	1.90	0.1511	0.2479	0.1644	0.0431	0.0041	0.0036	PR	
									7	1.60	0.1539	0.2519	0.1440	0.0412	0.0078	0.0049	R	
									8	1.95	0.1510	0.2542	0.1680	0.0434	0.0078	0.0057	R	
									9	1.50	0.1569	0.2527	0.1323	0.0254	0.0092	0.0068	R	
									10	0.80	**	**	**	**	**	**	*	F
									11	1.20	0.1515	0.2507	0.1041	0.0411	0.0049	0.0047	PR	
									12	0.85	**	**	**	**	**	**	*	F
37	2-35	4-23-66	32000	1.11	467500	097	1140	3.46 L	1								*	F
									2								CO	
									3								CO	
									4								CO	
				1.18		110	1140	8.23 R	5	Signatures at cutoff and are non-reproducible							CO	
									6								*	F
									7								CO	
									8								CO	
									9								*	F
									10								CO	
									11								CO	
									12								CO	

TABLE III - Concluded.

DJM #	A/C#-Flt.#	Date	Alt. ft msl	Mach	A/C wt. @ boom (lbs.)	Hdg. °T	Boom Time (local)	Stat. offset n. mi.	Mic	OVPR lb/ft sq	DLTA t sec.	DLTA T sec.	IMPULS lb-sec/sq ft	TAUMAX sec.	TAU 75 sec.	TAU 50 sec	SIG. CAT	REMARKS
37 (cont.)			64000	2.2	362000	267	1255	BR 2.3 R	1	1.10	**	**	**	**	**	**	*	F
									2	2.45	0.1533	0.2861	0.1805	0.0312	0.0164	0.0082	R	
									3	2.85	0.1460	0.2902	0.1796	0.0086	0.0069	0.0036	NP	
									4	2.55	0.1507	0.2846	0.1739	0.0267	0.0178	0.0065	R	
							1255	S6 11.6 L	5	1.12	0.1561	0.2766	0.0773	0.0085	0.0060	0.0040	R	
									6	0.55	**	**	**	**	**	**	*	F
									7	0.96	0.1621	0.2891	0.0769	0.0419	0.0088	0.0080	R	
									8	0.88	0.1562	0.2820	0.0674	0.0230	0.0095	0.0079	R	
									9	0.70	**	**	**	**	**	**	*	F
									11	1.19	0.1418	0.2617	0.0782	0.0419	0.0138	0.0112	R	
									12	0.97	0.1631	0.2838	0.0808	0.0379	0.0217	0.0132	R	
38	2-38	5-16-66	44300	1.3	321000	290	1019	0.66 R	14	2.31	0.1631	0.2950	0.1945	0.0353	0.0193	0.0025	N	
									15	2.12	0.1656	0.2944	0.1877	0.0342	0.0191	0.0004	N	
									16	2.25	0.1644	0.2937	0.2000	0.0353	0.0168	0.0006	N	
39	2-42	5-27-66	39800	1.24	310500	275	1240	4.35 L	1	1.23	**	**	**	**	**	**	*	F
									2	2.57	0.1563	0.2896	0.1227	0.0002	0.0001	0.0001	SP	
									3	1.66	0.1651	0.2898	0.1413	0.0190	0.0080	0.0026	R	
									4	3.07	0.1594	0.2905	0.1464	0.0012	0.0003	0.0003	SP	
									5	2.53	0.1630	0.2809	0.1192	0.0016	0.0010	0.0006	SP	
									6	1.79	0.1573	0.2810	0.1470	0.0173	0.0068	0.0010	R	
									7	1.84	0.1573	0.2834	0.1376	0.0187	0.0077	0.0038	R	
									8	2.02	0.1556	0.2825	0.1512	0.0173	0.0060	0.0009	R	

Key: F Free Air Microphone

TABLE IV - MASTER DATA SPREADSHEET

DJM #	Date	A/C#-Flt.#	Pass #	Alt. ft msl	Mach	Hdg. °T	A/C Wt. @ Boom (lbs.)	Chase A/C Type	Time behind XB-70 sec.	Meas. Sites	Stat. Offset n. mi.	Boom Time local	No. Mics.	Microphone Arrangement	Sig. Type
1	3-4-65	1-7	1	50500	1.83	204	337000			B	3.56 R	1114	8	6G/2F	FF
								B-58	-						FF
								F-4	-						FF
2	4-20-65	1-10	1	48000	1.8	254	350000			S3	0	1213	8	6G/2F	FF
3	7-1-65	1-14	1	66000	2.6	296	310000			LS	0.5 L	0800	4	3G/1F	FF
										S3	6.1 R		4	3G/1F	
4	7-27-65	1-15	1	32000	1.23	017	423000			C	0.99 L	0732	8	6G/2F	NF
								B-58	0.56						FF
5	8-10-65	2-2	1	42300	1.38	171	357000			S3	5.0 L	0740	4	3G/1F	NF
								B-58	64						FF
6	8-18-65	2-3	1	46000	1.4	184	381000			LS	15.0 L	1330	4	4G	FF
7	8-20-65	2-4	1	42500	1.42	151	387000			S3	7.0 L	1159	4	3G/1F	NF
										LS	2.5 L		4	3G/1F	
8	9-22-65	1-16	1	33800	1.5	007	456000			C	1.56 R	1225	4	3G/1F	NF
								B-58	-						FF
9	9-29-65	2-6	1	33000	1.35	001	439900			C	0.66 L	1220	4	3G/1F	NF
								B-58	0.7						NF
10	10-5-65	2-7	1	31000	1.42	359	437900			C	0.74 R	1243	4	3G/1F	NF
								B-58	3.6						FF
11	10-11-65	2-8	1	34000	1.51	008	422900			C	0.08 L	1332	4	3G/1F	NF
								B-58	1.3						FF
12	10-14-65	1-17	1	41000	1.76	010	433000			C	2.14 L	0936	4	3G/1F	FF
								B-58	1.4						FF
13	10-16-65	2-9	1	50000	1.4	307	313000			LS	9.88 L	1027	8	6G/2F	FF
14	11-2-65	2-11	1	50500	1.8	289	317000			LS	5.68 R	1255	3	2G/1F	FF
15	11-4-65	1-18	1	41500	1.87	274	347800			S3	5.35 R	1105	4	3G/1F	FF
								B-58	0.58						FF
16	11-18-65	1-21	1	41500	1.61	322	357300			S3	2.14 R	1338	8	6G/2F	NF
								B-58	3.2						FF
								T-38	8						FF
17	11-30-65	1-22	1	53000	1.82	276	325500			S3	10.4 L	1010	8	6G/2F	FF
18	12-1-65	2-13	1	60000	2.31	289	328000			S3	4.86 R	1030	8	6G/2F	NF
19	12-2-65	1-23	1	54000	1.79	254	317200			S3	5.93 R	1040	8	6G/2F	FF
20	12-3-65	2-14	1	65500	2.48	276	329500			S3	0.06 R	1030	8	6G/2F	FF
21	12-10-65	1-25	1	30500	1.55	332	436329			C	2.32 R	1315	4	3G/1F	NF
			2	38000	1.25	163	371229			C	9.48 L	1400	4	3G/1F	NF
22	12-11-65	2-15	1	37000	1.5	003	453645			C	1.40 L	0918	4	3G/1F	NF
				70000	2.9	298	320625			S3	5.23 R	1028	4	3G/1F	FF

TABLE IV - Concluded.

DJM #	Date	A/C#-Flt.#	Pass #	Alt. ft msl	Mach	Hdg. °T	A/C Wt. @ Boom (lbs.)	Chase A/C Type	Time behind XB-70 sec.	Meas. Sites	Stat. Offset n. mi.	Boom Time local	No. Mics.	Microphone Arrangement	Sig. Type
23	12-21-65	2-16	1	70000	2.92	276	321484			S3	1.61 L	1427	4	3G/1F	FF
24	1-3-66	2-17	1	69800	2.91	306	317331			S3	7.11 R	1020	3	1G/2F	FF
25	1-11-66	1-31	1	44900	1.8	266	369179			S3	6.83 R	0750	7	6G/1F	FF
26	1-12-66	2-18	1	66000	2.05	285	297352			S3	2.06 R	1018	8	6G/2F	FF
27	1-15-66	1-33	1	45100	1.78	277	373097			S3	7.74 R	1153	8	6G/2F	FF
28	3-4-66	1-36	1	41000	1.75	295	445500			BR	3.41 L	1140	4	3G/1F	FF
				42000	1.82	301				S3	0.33 R	1140	8	6G/2F	FF
29	3-7-66	1-37	1	41000	1.17	283	343700			BR	1.18 L	1532	4	3G/1F	NF
				40000						S3	1.84 R	1532	8	6G/2F	NF
30	3-15-66	2-24	1	68500	2.66	291	310000			BR	0.66 R	1030	4	3G/1F	FF
				69300						S3	3.08 R	1030	8	6G/2F	FF
31	3-17-66	2-25	1	66000	2.74	295	308000			BR	5.43 R	1015	4	3G/1F	FF
										S3	7.41 R	1015	5	4G/1F	FF
32	3-19-66	2-26	1	70300	2.84	297	304500			BR	0.54 L	1210	4	3G/1F	FF
										S3	1.58 R	1210	8	6G/2F	FF
33	3-28-66	1-40	1	51000	1.8	249	319300			BR	0.33 L	1053	4	3G/1F	FF
										S3	4.91 R	1053	8	6G/2F	FF
34	3-29-66	2-29	1	44000	1.56	240	313800			BR	1.98 R	1137	4	3G/1F	FF
										S3	7.46 R	1137	8	6G/2F	FF
			2	36400	1.36	132	303700			BR	7.74 L	1152	4	3G/1F	FF
										S3	8.20 L	1152	8	6G/2F	FF
35	4-5-66	1-42	1	52000	1.55	273	333900			BR	0.49 L	1138	12	8G/4F	FF
36	4-21-66	1-45	1	53000	2.26	260	337800			BR	4.82 L	1646	8	6G/2F	FF
37	4-23-66	2-35	1	32000	1.11	097	467500			BR	3.46 L	1140	4	3G/1F	NF
					1.18	110				S3	8.23 R	1140	8	6G/2F	NF
			2	64000	2.2	267	362000			BR	2.3 R	1255	4	3G/1F	NF
										S3	11.6 L	1255	7	5G/2F	NF
38	5-16-66	2-38	1	44300	1.3	290	321000			BR	0.66 R	1019	3	3G	NF
39	5-27-66	2-42	1	39800	1.24	275	310500			BR	4.35 L	1240	8	7G/1F	NF

Key:

B	Beatty, Nevada - 4,950 ft. (above sea level)
BR	Boron, California - 2,400 ft.
C	Coaldale, Nevada - 4,800 ft.
LS	Lakesite - EAFB, California - 2,300 ft.
S3	Site 3 - EAFB, California - 2,700 ft.
F	Free Air Microphone
G	Ground Microphone
FF	Far-Field Signature
NF	Near-Field Signature

TABLE V - XB-70 ELECTRONIC DATABASE DISK GUIDE FOR SONIC BOOM FLIGHTS OF MARCH 1965 THROUGH MAY 1966.

XB-70 ELECTRONIC DATABASE DISK GUIDE:
(flights 3/65 - 5/66)

(* EEI - July 31, 1991 - TNK/VES/DJM *)

The XB-70 electronic database diskettes are organized by DJM report number (Domenic Maglieri). The table below describes the information found on each set of report disks.

Following the table, is a breakdown of the filenames used and a description of the file formats.

XB-70 DATA SUMMARY TABLE

DJM#	XB70	ATMO	ON	TRK	T-38	F-4	B-58	NO. SITES	NO. PASSES	SITE#1/MIC#	SITE#2/MIC#	NOTES
1	8	3	4			8	8	1	1	B / 1-8		
2	8	3						1	1	S3 / 1-8		
3	8		4					2	1	S / 1-4	S3 / 5-8	
4	8	3	4	1			8	1	1	C / 1-8		
5	4	3	3				4	1	1	S3 / 5-8		
6	2							1	1	LS / 1-2		
7	8	3	4					2	1	S3 / 1-4	S3 / 5-8	
8	4	3	4	1			4	1	1	C / 5-8		
9	4	3	4	1			4	1	1	C / 5-8		
10	4	3	4	1			4	1	1	C / 5-8		
11	4	3	4	1			4	1	1	C / 5-8		
12	4	3	4	1			4	1	1	C / 5-8		
13	8	3	2	1				1	1	LS / 1-8		
14	3	3	4	1				1	1	LS / 5-7		
15	4		4	1			4	1	1	S3 / 5-8		
16	8	3	4	1	8		8	1	1	S3 / 1-8		
17	8	3	4	1				1	1	S3 / 1-8		
18	8	3	4	1				1	1	S3 / 1-8		
19	8	3	4	1				1	1	S3 / 1-8		
20	8	3	4	1				1	1	S3 / 1-8		
21	8	6	4	2				1	2	C / 5-8(2)		* See special file naming conventions #2
22	8	6	8	2				2	1	S3 / 1-4	C / 5-8	* See special file naming conventions #3
23	4	3	4	1				1	1	S3 / 1-4		

TABLE V - Continued.

DJM#	XB70	ATMO	ON	TRK	T-38	F-4	B-58	NO. SITES	NO. PASSES	SITE#1/MIC#	SITE#2/MIC#	NOTES
24	3	3	4	1				1	1	S3 / 6-8		
25	7	3	4	1				1	1	S3 / 1-3,5-8		
26	8	3	2	1				1	1	S3 / 1-8		
27	8	3	4	1				1	1	S3 / 1-8		
28	12	3	4	2				2	1	BR / 1-4	S3 / 5-12	
29	12	3	2	2				2	1	BR / 1-4	S3 / 5-12	
30	12	3	2	2				2	1	BR / 1-4	S3 / 5-12	
31	9	3	2	2				2	1	BR / 1-4	S3 / 5-8,12	
32	12	3	4	2				2	1	BR / 1-4	S3 / 5-12	
33	12	3	2	2				2	1	BR / 1-4	S3 / 5-12	
34	24	6	8	4				2	2	BR / 1-4(2)	S3 / 5-12(2)	* See special file naming conventions #4
35	12	3	4	1				1	1	BR / 1-12		
36	8	3	4	1				1	1	BR / 5-12		
37	11	3	4	2				2	2	BR / 1-4	S3 / 5-12	* See special file naming conventions #4
38	3	3	4	1				1	1	BR / 14-16		
39	8	3	4	1				1	1	BR / 1-8		

TITLE DESCRIPTIONS:

DJM#	Domenic Maglieri Numbering Systm
XB70	Number of XB70 signatures
ATMO	Number of on atmospheric graphs (Temperature, Wind Velocity)
ON	Number of on board time histories (Mach, Altitude, Angle of Attack, Normal Acceleration)
TRK	Number of tracking charts (1 per site or pass)
T-38	Number of T-38 signatures
F-4	Number of F-4 signatures
B-58	Number of B-58 signatures
SITE	Number of Microphone Sites
PASS	Number of Aircraft Passes
SITE 1	Location of Site #1
SITE 2	Location of Site #2

LEGEND

B	Beatty, Nevada
BR	Boron, California
C	Coaldale, Nevada
LS	Lakesite - EAFB, California
S3	Site 3 - EAFB, California
(2)	Depicts two sets of signatures for each microphone (multiple passes)

TABLE V - Continued.

```
FILE NAMING CONVENTIONS:

(1) Reports with 1 Microphone Site and 1 Pass:

    Signatures:
r##m##.xy     ( r## = report number , m## = microphone )
example:      r01m01.xy - report 1, microphone 1

    Spectrum:
r##m##.spc    ( r## = report number , m## = microphone )
example:      r01m01.spc

    Time Histories (Atmospheric Weather Data and On Board Data):

attk##.xy( Angle of Attack, degrees )
mach##.xy       ( Mach Number )
altd##.xy       ( Altitude, feet )
norm##.xy       ( Normal Acceleration, g )
temp##.xy( Altitude (feet) vs. Temperature (degrees celsius) )
alon##.xy( Altitude (feet) vs. Wind Velocity (feet/sec.) )
perp##.xy       ( Altitude (feet) vs. Wind Velocity (feet/sec.) )

Note: ( ## = report number )

    Tracking Data:

r##trj.gnd

Note: ( ## = report number )

(2) Reports with 2 Passes:

    Signatures:
r###m##.xy( r### = report number and pass number, m## = microphone number )
example:     r012m01.xy - report 1, pass 2, microphone 1

    Spectrum:
Same as signature but with .spc extension

    Time Histories (Atmospheric Weather Data and On Board Data):

attk###.xy( Angle of Attack, degrees )
mach###.xy      ( Mach Number )
altd###.xy      ( Altitude, feet )
```

TABLE V - Continued.

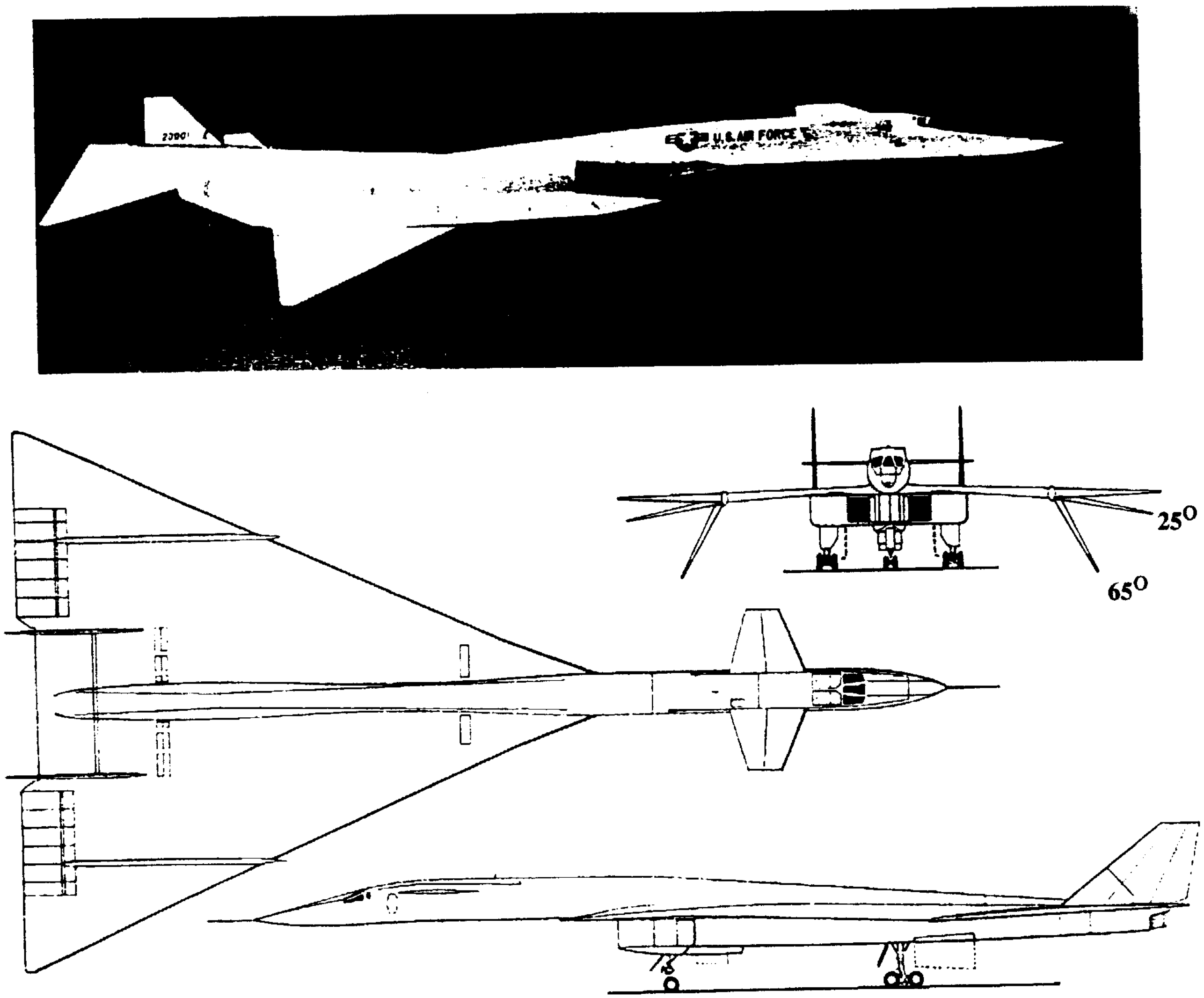
```
norm###.xy      ( Normal Acceleration, g )
temp###.xy( Altitude (feet) vs. Temperature (degrees celsius) )
alon###.xy( Altitude (feet) vs. Wind Velocity (feet/sec.) )
perp###.xy     ( Altitude (feet) vs. Wind Velocity (feet/sec.) )

Note: ( ### = report number and pass number )

    Tracking Data:

r###trj.gnd

Note: ( ### = report number and pass number )

(3) Reports with 2 Sites:

    Signatures:
No change in format.

    Spectrum:
No change in format.

    Time Histories (Atmospheric Weather Data and On Board Data):

attk###.xy( Angle of Attack, degrees )
mach###.xy      ( Mach Number )
altd###.xy      ( Altitude, feet )
norm###.xy      ( Normal Acceleration, g )
temp###.xy( Altitude (feet) vs. Temperature (degrees celsius) )
alon###.xy( Altitude (feet) vs. Wind Velocity (feet/sec.) )
perp###.xy     ( Altitude (feet) vs. Wind Velocity (feet/sec.) )

Note: ( ### = report number and site number )

    Tracking Data:

r###trj.gnd

Note: ( ### = report number and site number )

(4) Reports with 2 Sites and 2 Passes:

    Signatures:
r###m##.xy( r### = report number and pass number, m## = microphone number )
example:     r012m01.xy - report 1, site 2, microphone 1
```

TABLE V - Continued.

```
    Spectrum:
Same as signature but with .spc extension

    Time Histories (Atmospheric Weather Data and On Board Data):

attk###.xy( Angle of Attack, degrees )
mach###.xy      ( Mach Number )
altd###.xy      ( Altitude, feet )
norm###.xy      ( Normal Acceleration, g )
temp###.xy( Altitude (feet) vs. Temperature (degrees celsius) )
alon###.xy( Altitude (feet) vs. Wind Velocity (feet/sec.) )
perp###.xy     ( Altitude (feet) vs. Wind Velocity (feet/sec.) )

Note: ( ### = report number and pass number )

    Tracking Data:

r###trj.gnd

Note: ( ### = report number and site number )

FILE FORMATS:

     Signature files: (example: r01m01.xy)

        Anywhere from 2000-4000 lines long
Time (seconds), Overpressure (lb/ft2)
F14.6, F14.6

     Spectrum files: (example: r01m01.spc)

Around 1700 lines long
Frequency (Hz), SPL (dB)
        F11.2, F11.4

     Tracking Files: (example: r18trj.gnd)

1st Line origin of boom in seconds
Around 20-40 lines long,
time (sec), east of site (feet), north of site (feet)
F14.0, F14.0, F14.0

     On Board Temperature Data: (example temp01.xy)

Around 500 lines long
```

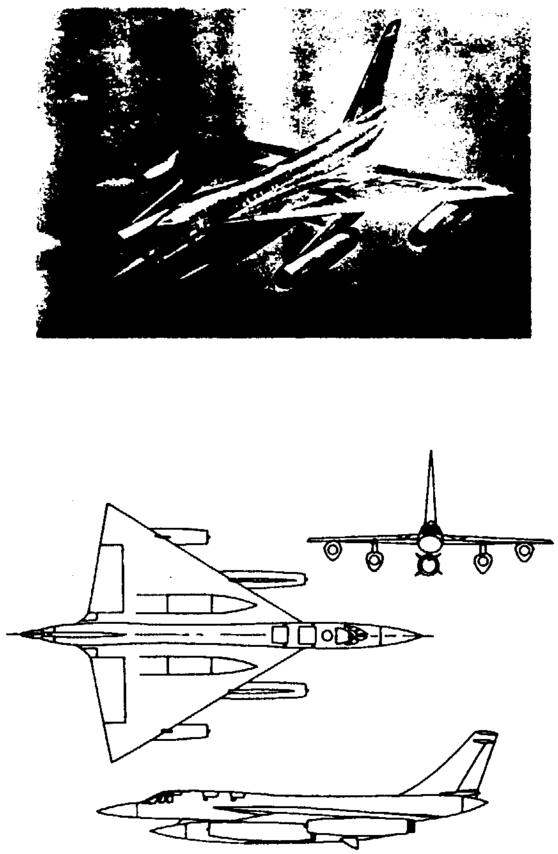
TABLE V - Concluded.

```
 Temperate (celsius), Altitude (feet)
        F14.6, F14.6

     On Board Wind Velocity Along Flight Path: (example alon01.xy)

Around 500 lines long
 Wind Velocity (ft/sec), Altitude (feet)
        F14.6, F14.6

     On Board Wind Velocity Perpendicular to Flight Path: (example perp01.xy)

Around 500 lines long
 Wind Velocity (ft/sec), Altitude (feet)
        F14.6, F14.6

     On Board Altitude Data: (example: altd01.xy)

1st Line of file
Origin of Boom in seconds (maybe two - report pending)
Time (seconds), Altitude (feet)
F5.1, F5.1

remaining 20-30 lines
        Time (seconds), Altitude (feet)
F14.6, F14.6

     On Board Mach Data: (example: mach01.xy)

Around 20-30 lines
Time (seconds), Mach (#)
F14.6, F14.6

     On Board Angle of Attack Data: (example: attk01.xy)

Around 20-30 lines
Time (seconds), Angle of Attack (degrees)
F14.6, F14.6

     On Board Normal Acceleration Data: (example: norm01.xy)

Around 20-30 lines
Time (seconds), Normal Acceleration (g)
F14.6, F14.6
```

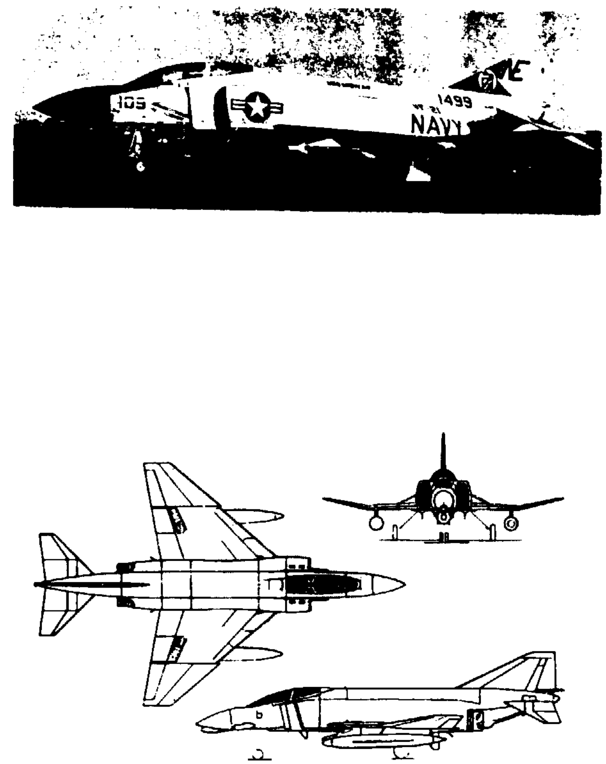


(a) XB-70

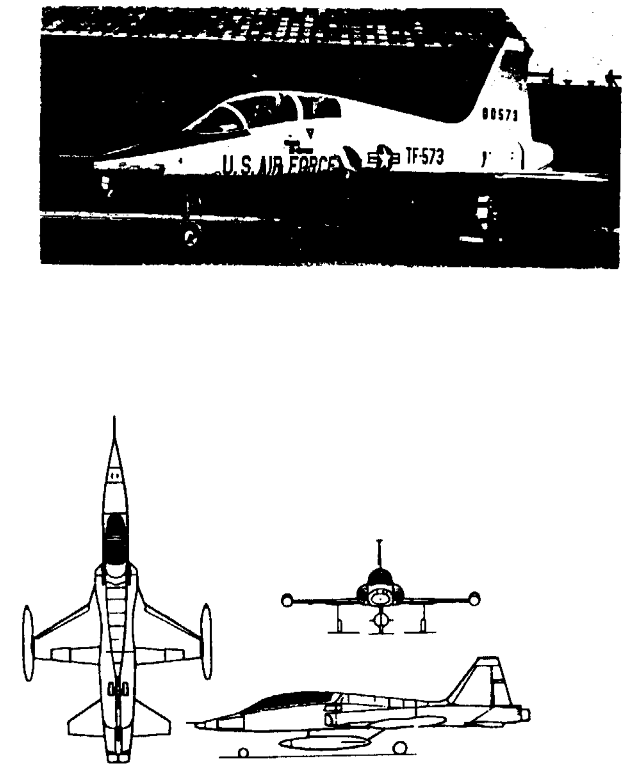
Figure 1.- Photographs and three-view sketches of sonic boom test aircraft.



(b) B-58



(c) F-4



(d) T-38

Figure 1.- Concluded.

Location of Site	Site Elevation Above Sea Level	Sets of Measurements Acquired at Each Site
EAFB Site 3	2800 ft	24
EAFB Lakesite	2300 ft	8
Boron	2400 ft	12
Beatty	4950 ft	1
Coaldale	4800 ft	8

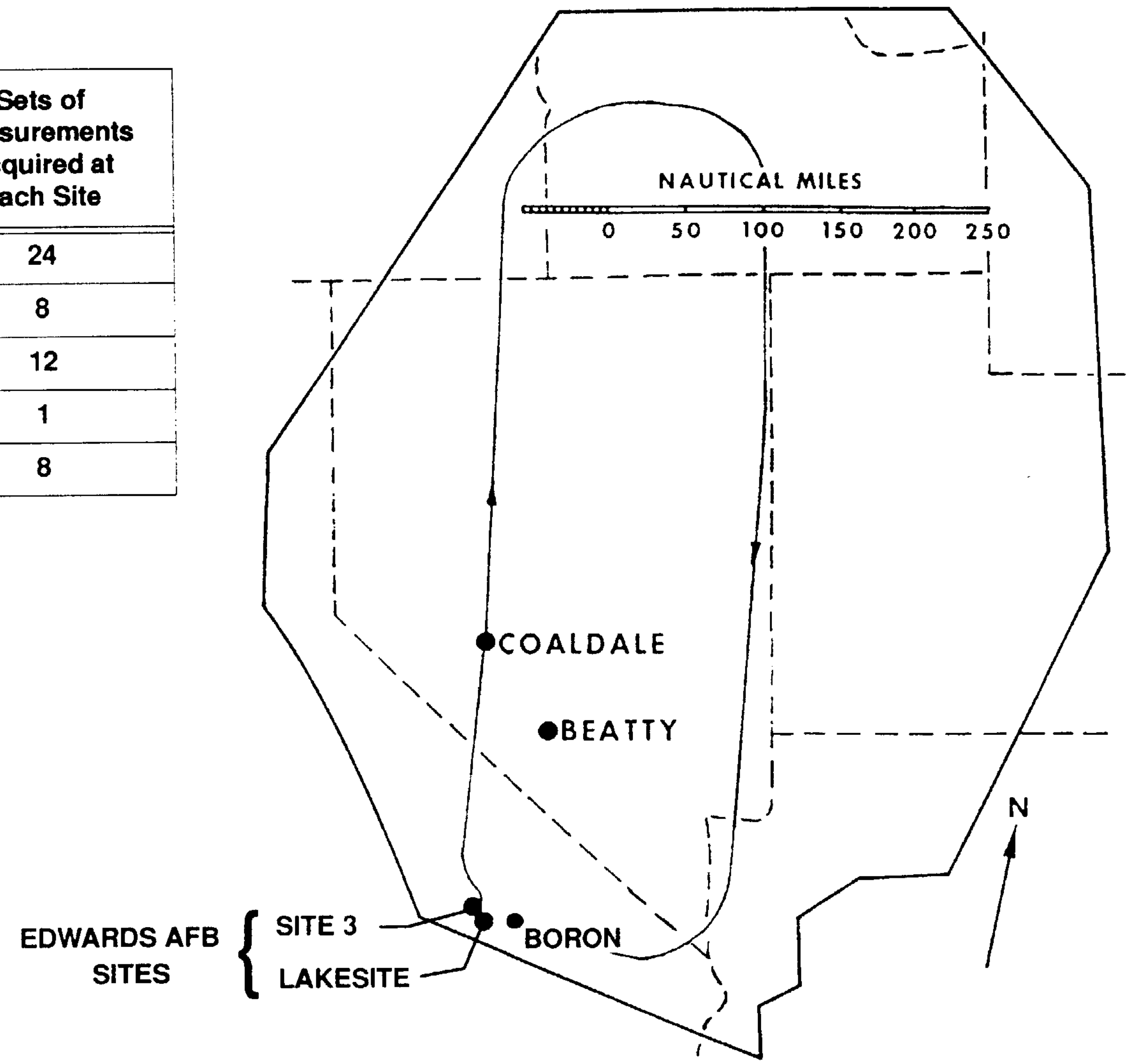


Figure 2.- Typical XB-70 flight plan and sonic boom measurement locations.

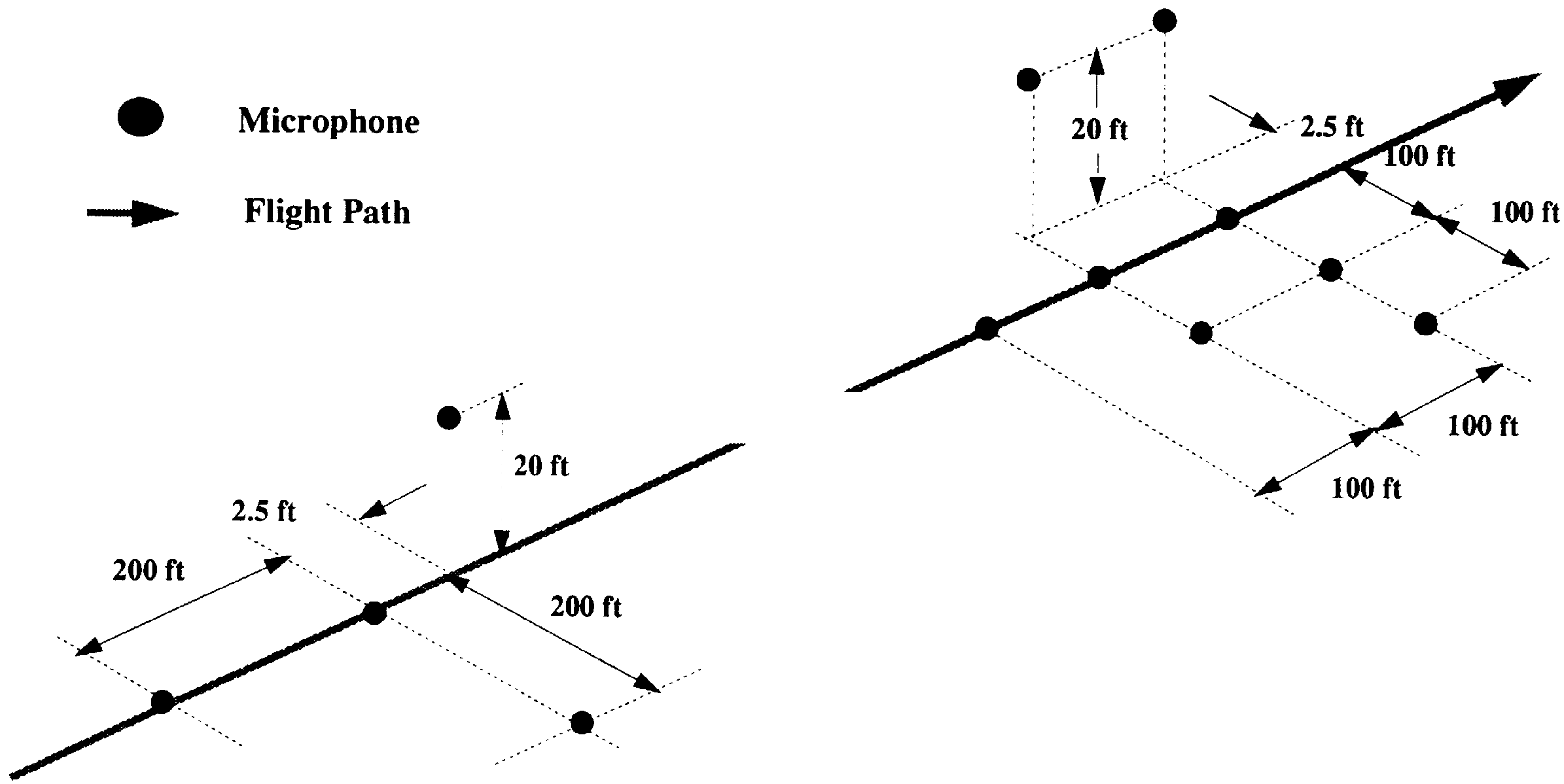
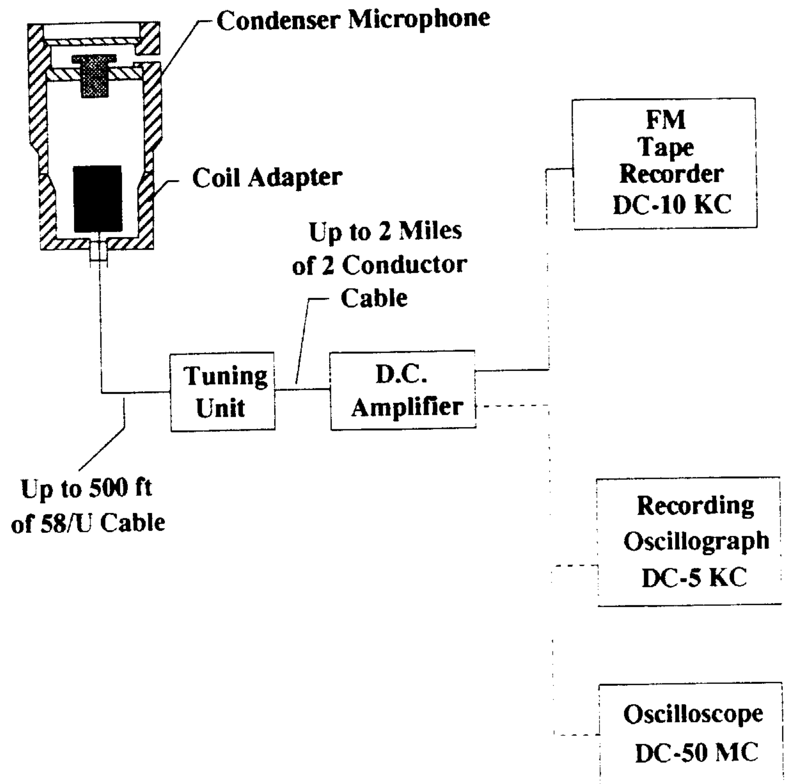
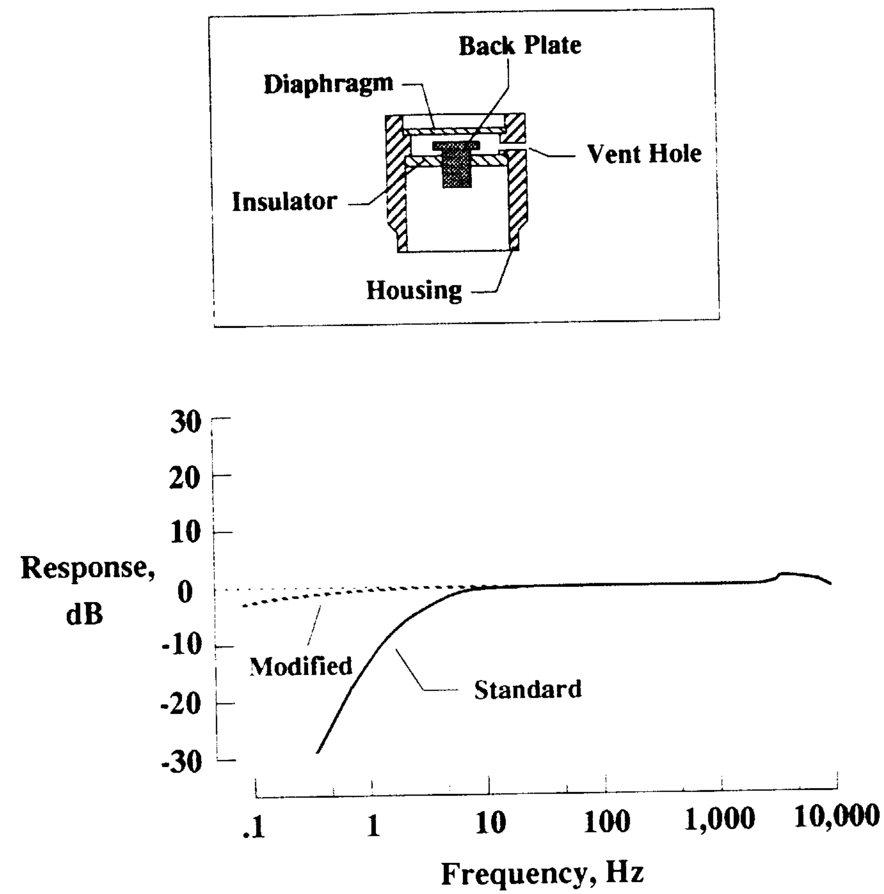


Figure 3.- Typical sonic boom measurement station layouts.



(a) block diagram of measuring system



(b) frequency response of standard & modified condenser microphone system

Figure 4.- Sonic boom measurement instrumentation.

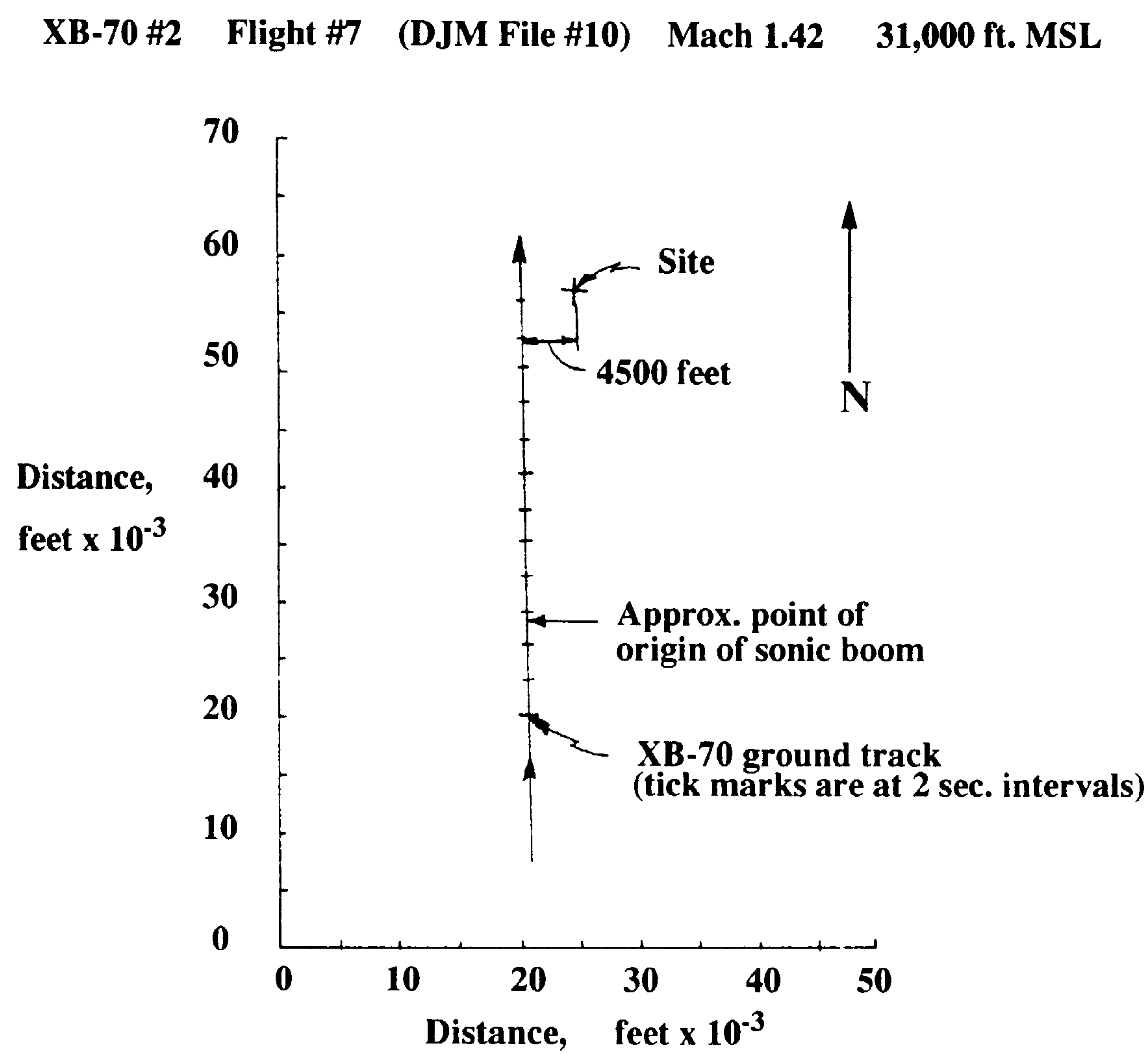


Figure 5.- Typical radar ground track information.

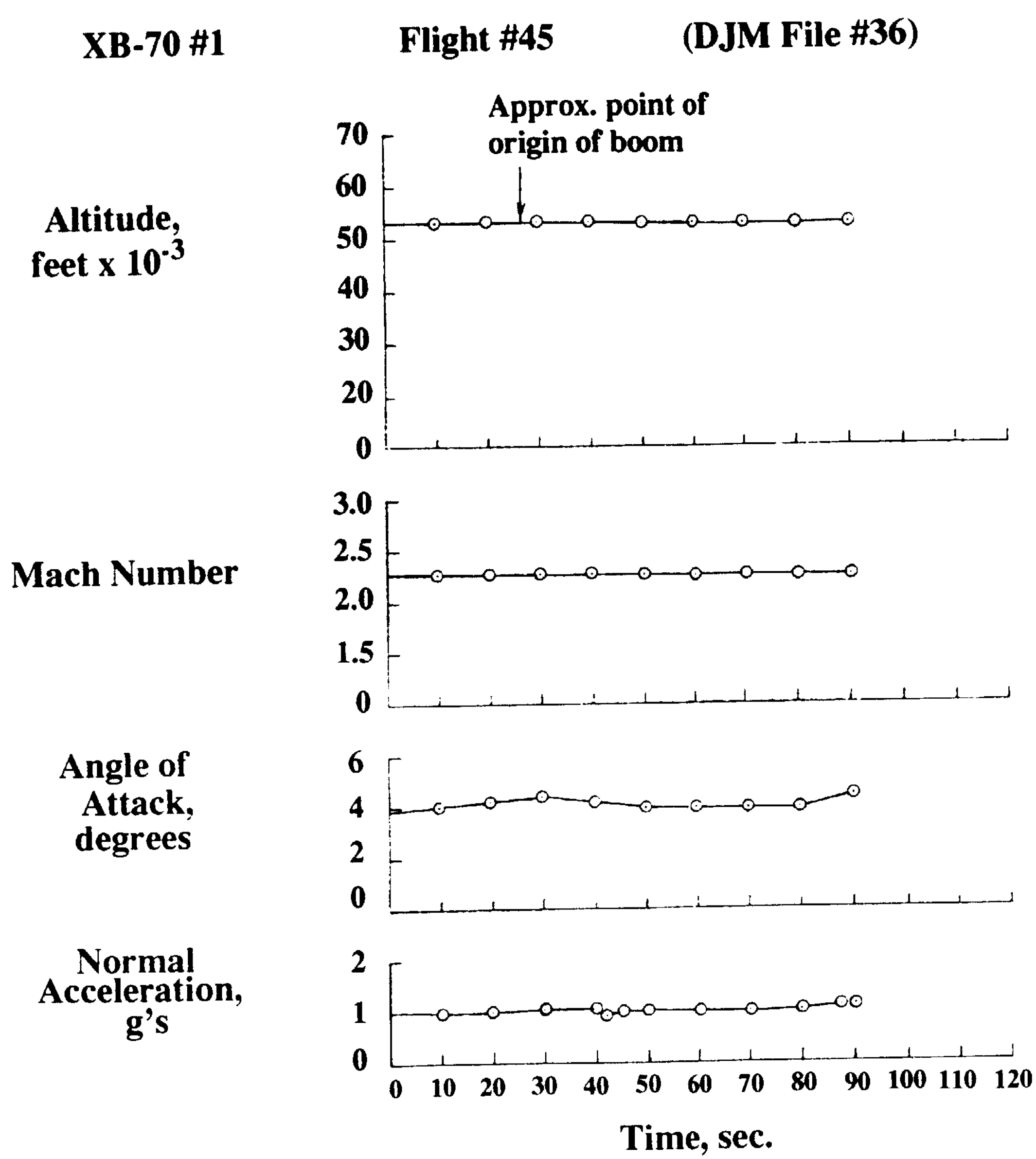


Figure 6.- XB-70 onboard operational flight data.

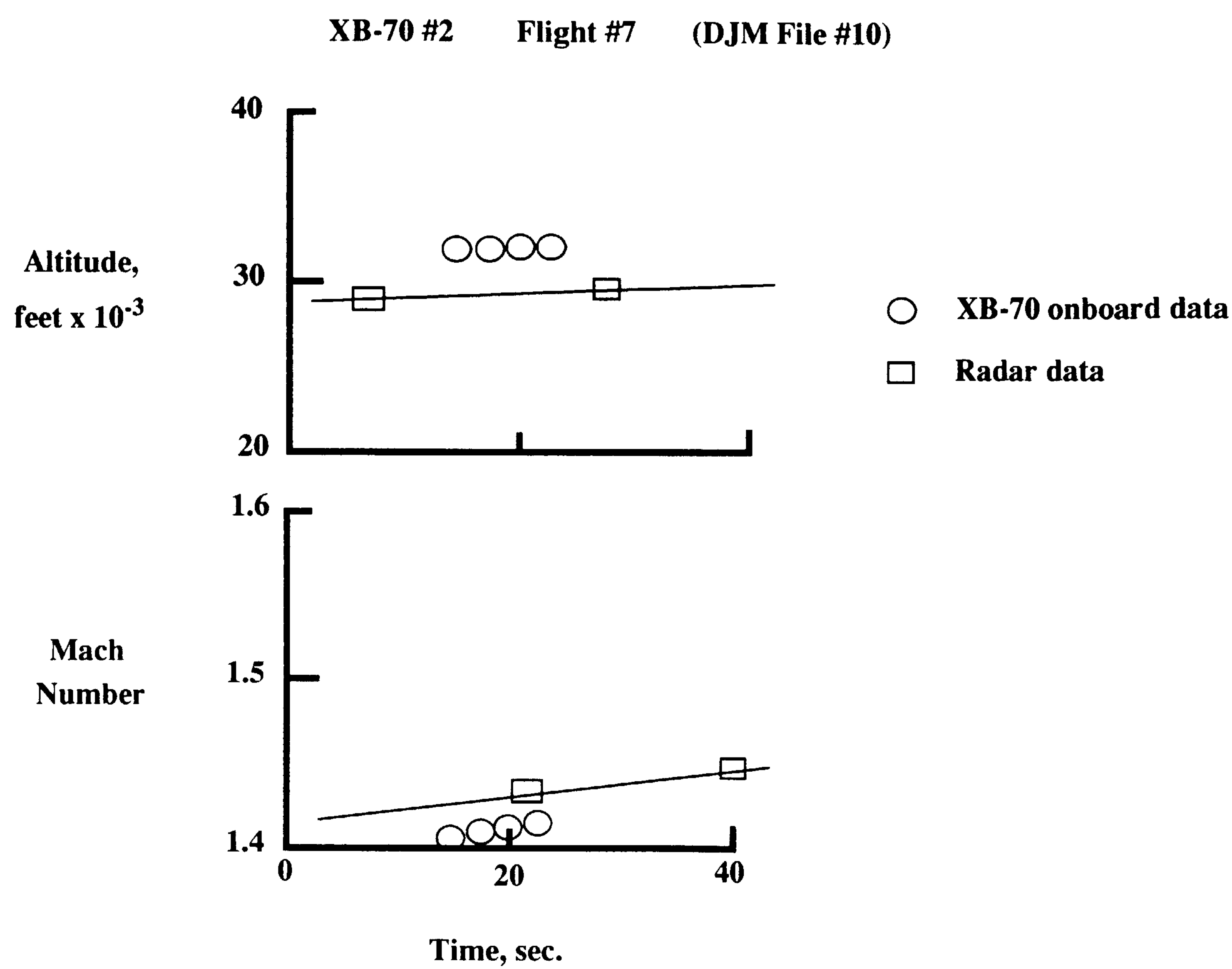


Figure 7.- Comparison of aircraft Mach number and altitude results obtained from onboard flight systems and ground based radar.

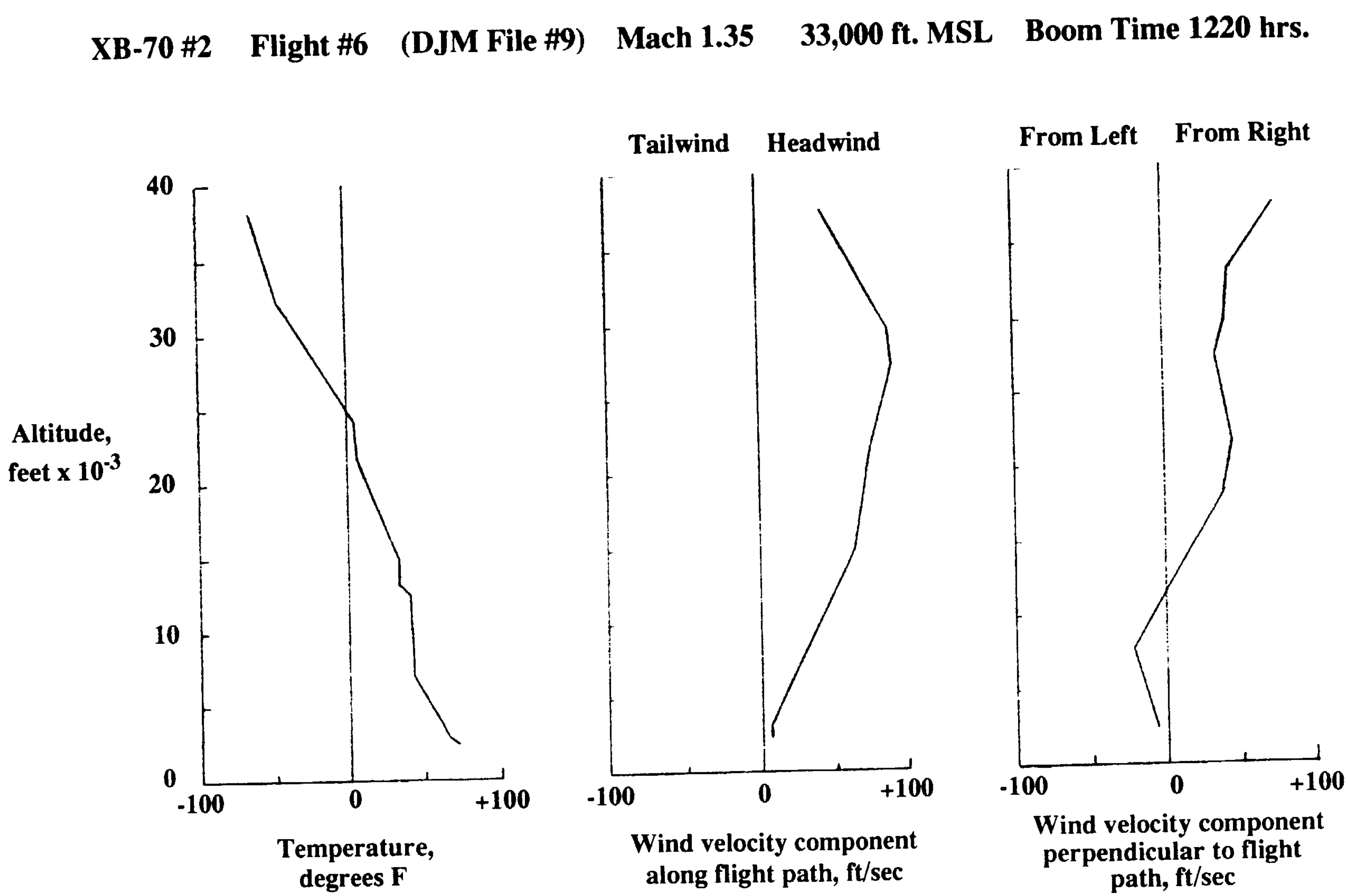


Figure 8.- Sample of upper air weather information developed from Rawinsonde data during test time period.

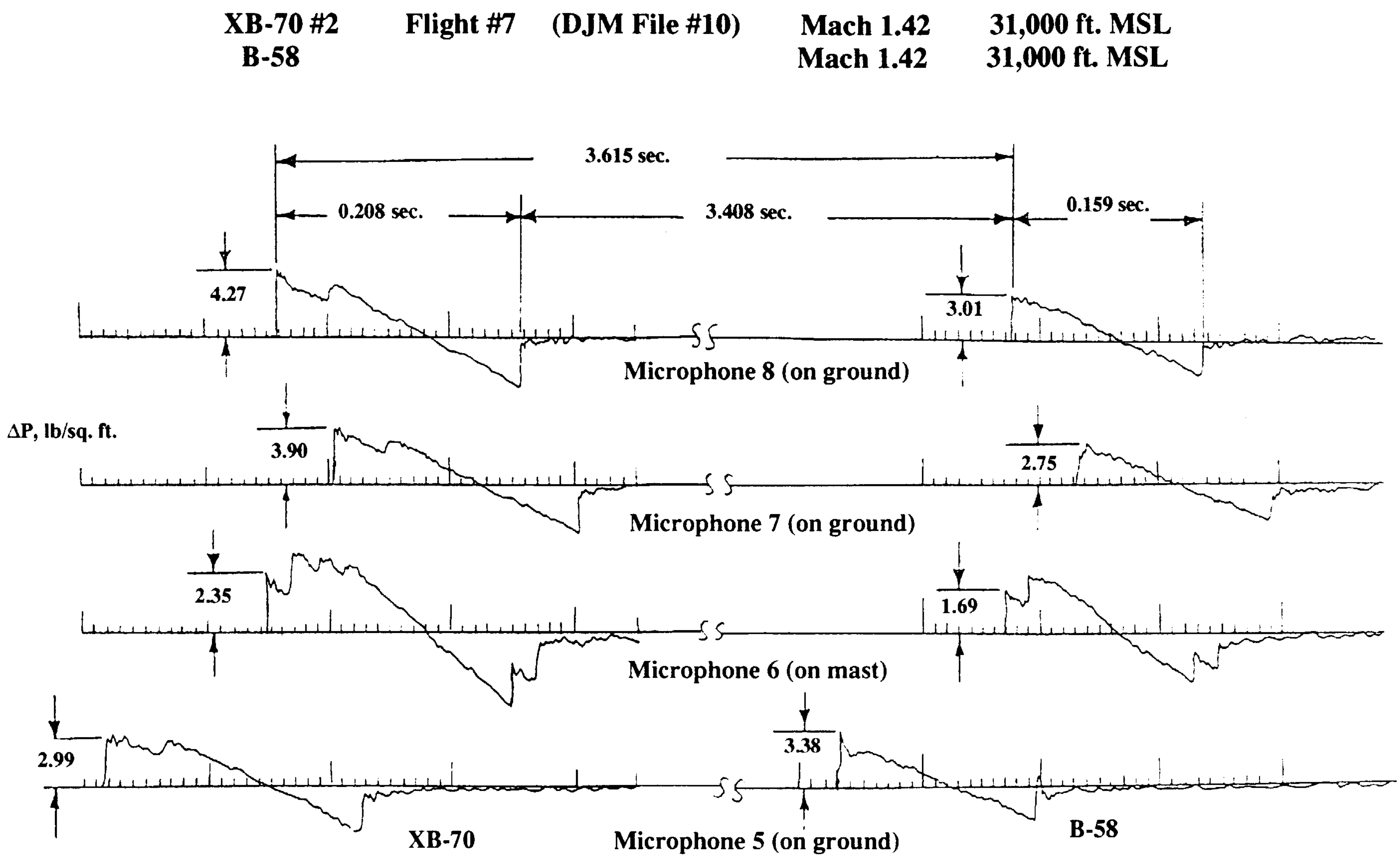


Figure 9.- Samples of measured sonic boom signatures.

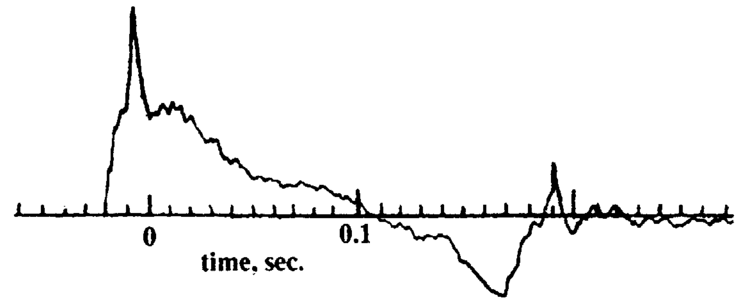
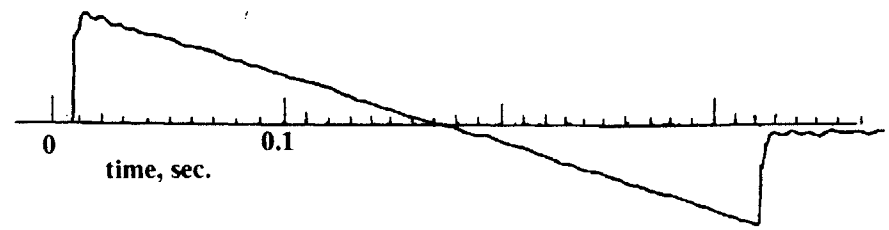
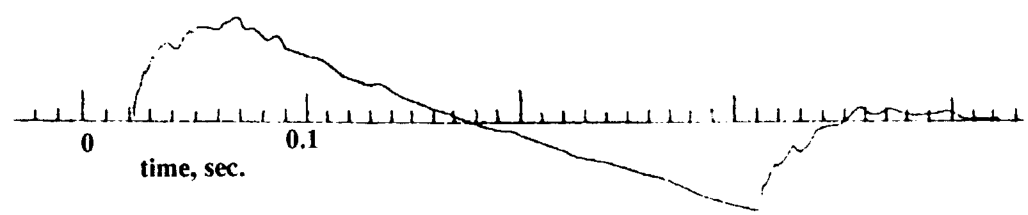
XB-70	Flight #	(DJM File #)	Microphone		Waveform Category
1	33	27	4		SPR
2	18	26	2		N
1	42	35	6		R

Figure 10.- Examples of measured XB-70 sonic boom signature variability.

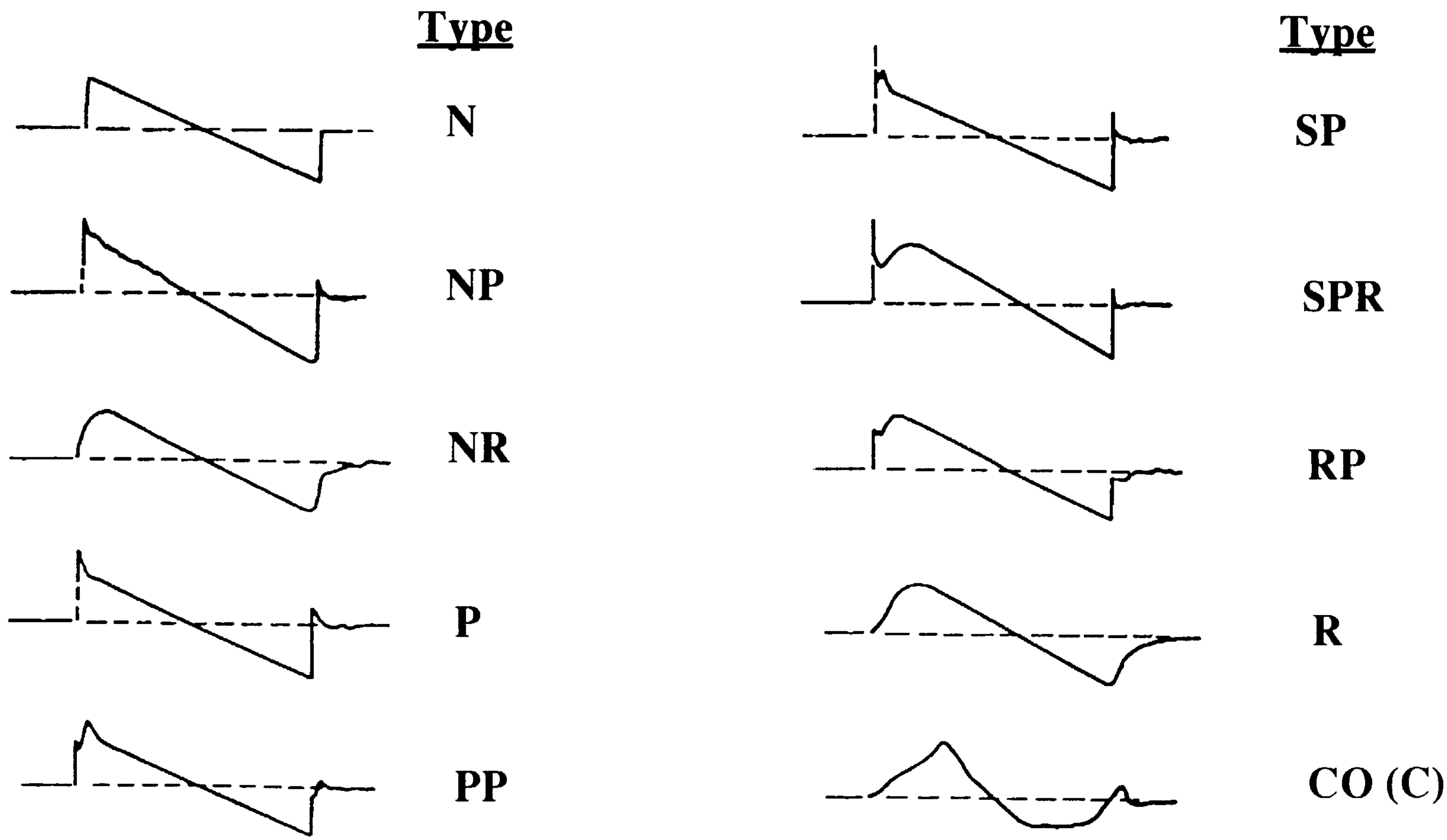


Figure 11.- Sonic boom waveform categories.

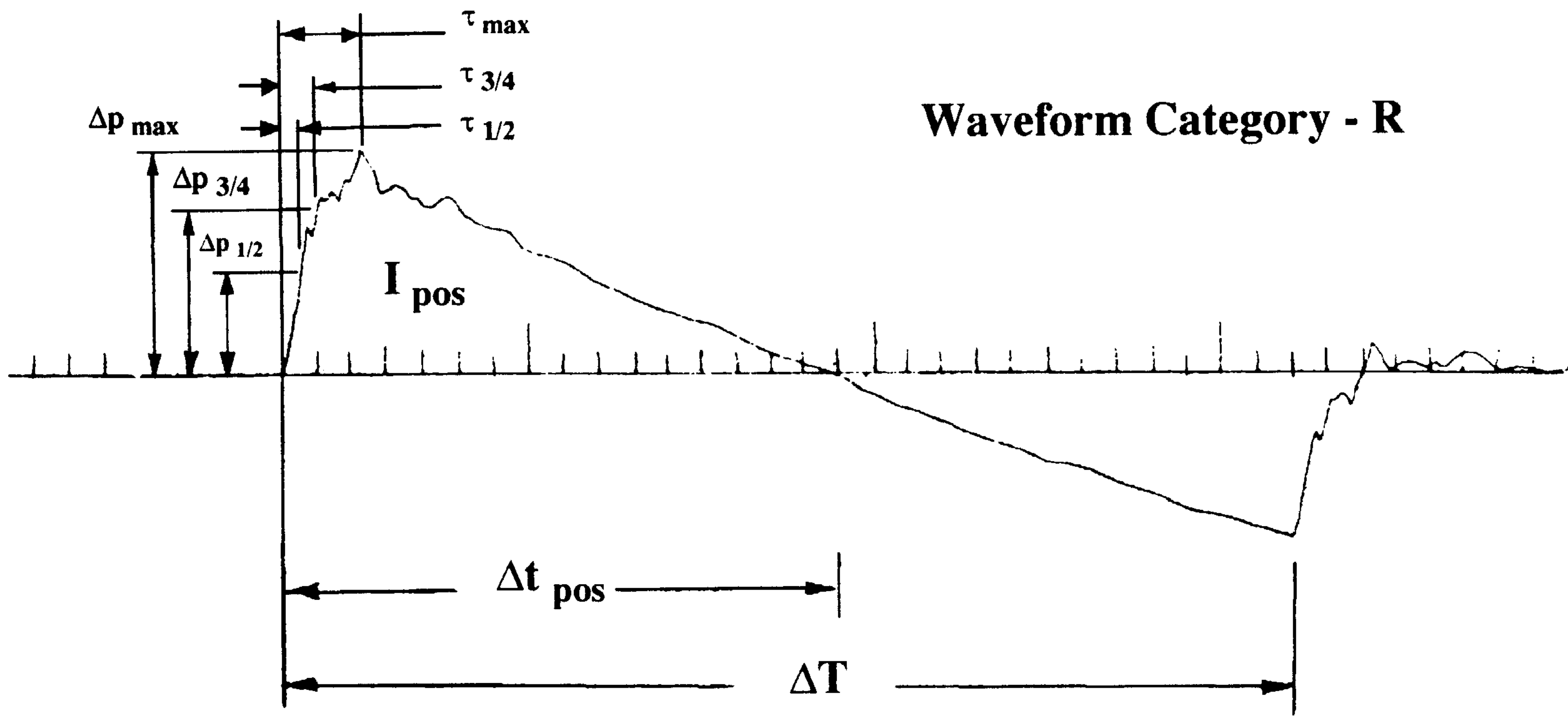


Figure 12.- Sonic boom signature descriptors.

XB-70 #1 Flight #7 (DJM #1) Microphone #1 (20 foot mast)

- Optical scanner rate = 300 readings / inch
- Original trace frequency response = 0.1 Hz to 5000 Hz

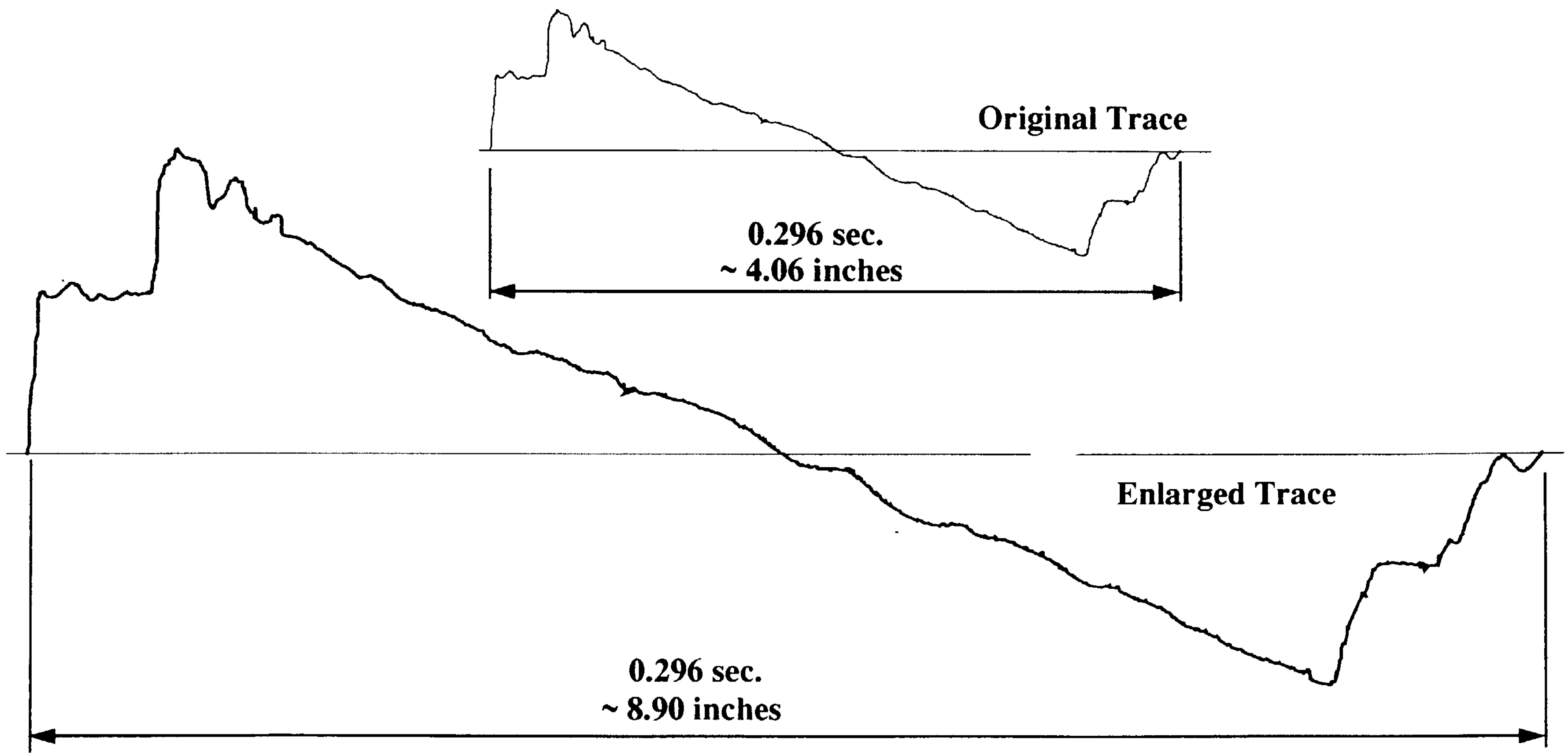
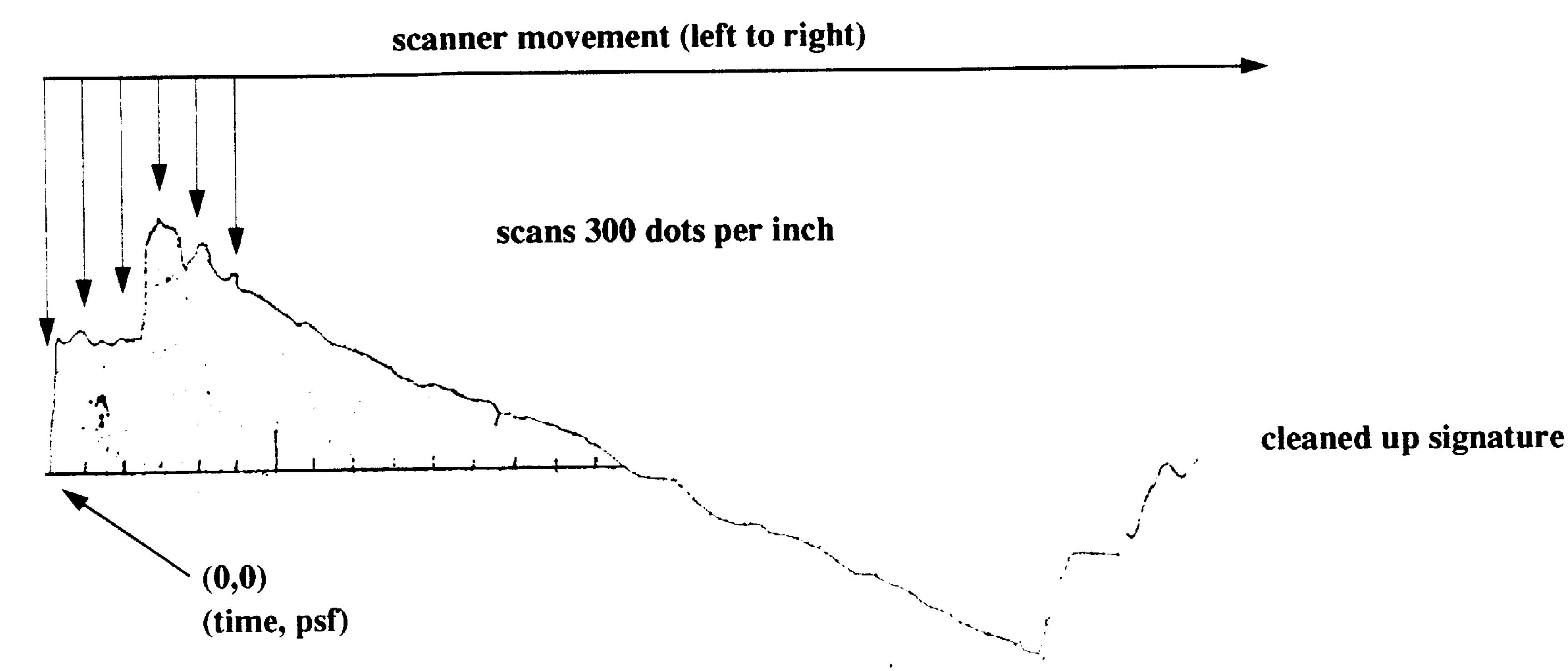


Figure 13.- Methods of preparing sonic boom traces for optical scanning and digitizing.



- Gaps in signatures are filled prior to scanning the signature.
- As a result of the method of scanning, hand drawn shock fronts will not be read as having negative rise times.

Figure 14.- Nature of optical scanner operation.

XB-70 #1 Flight #7 (DJM #1) microphone #1 (20-foot mast)

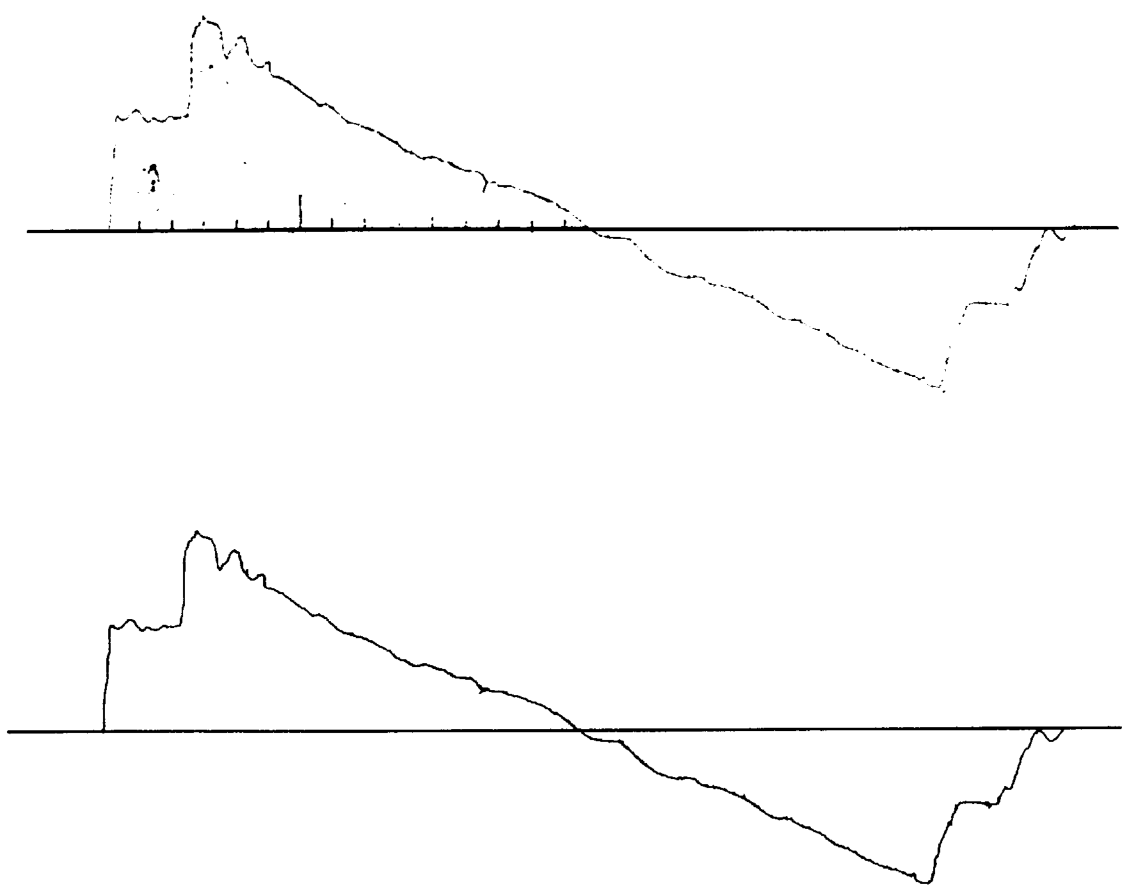
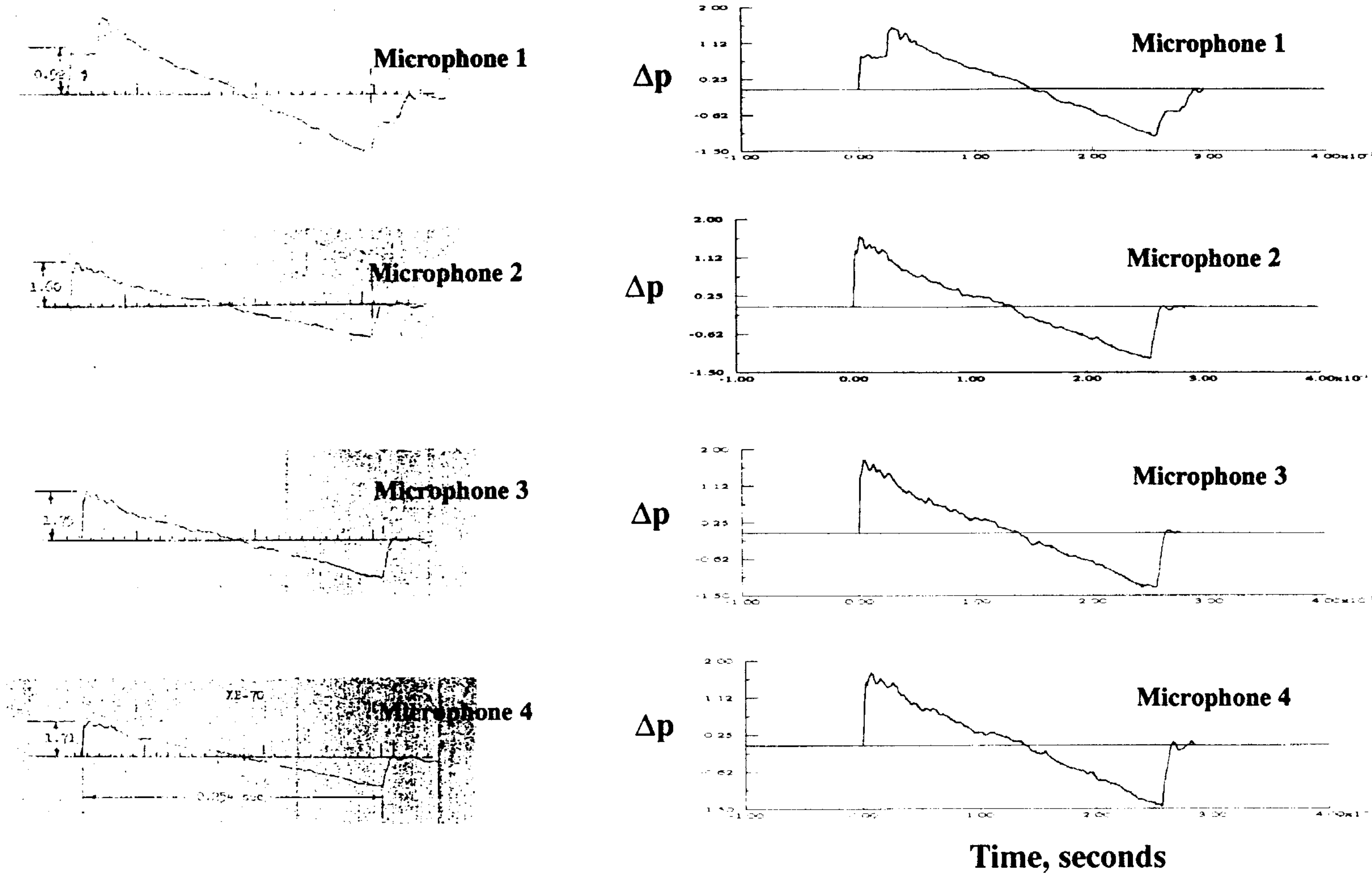


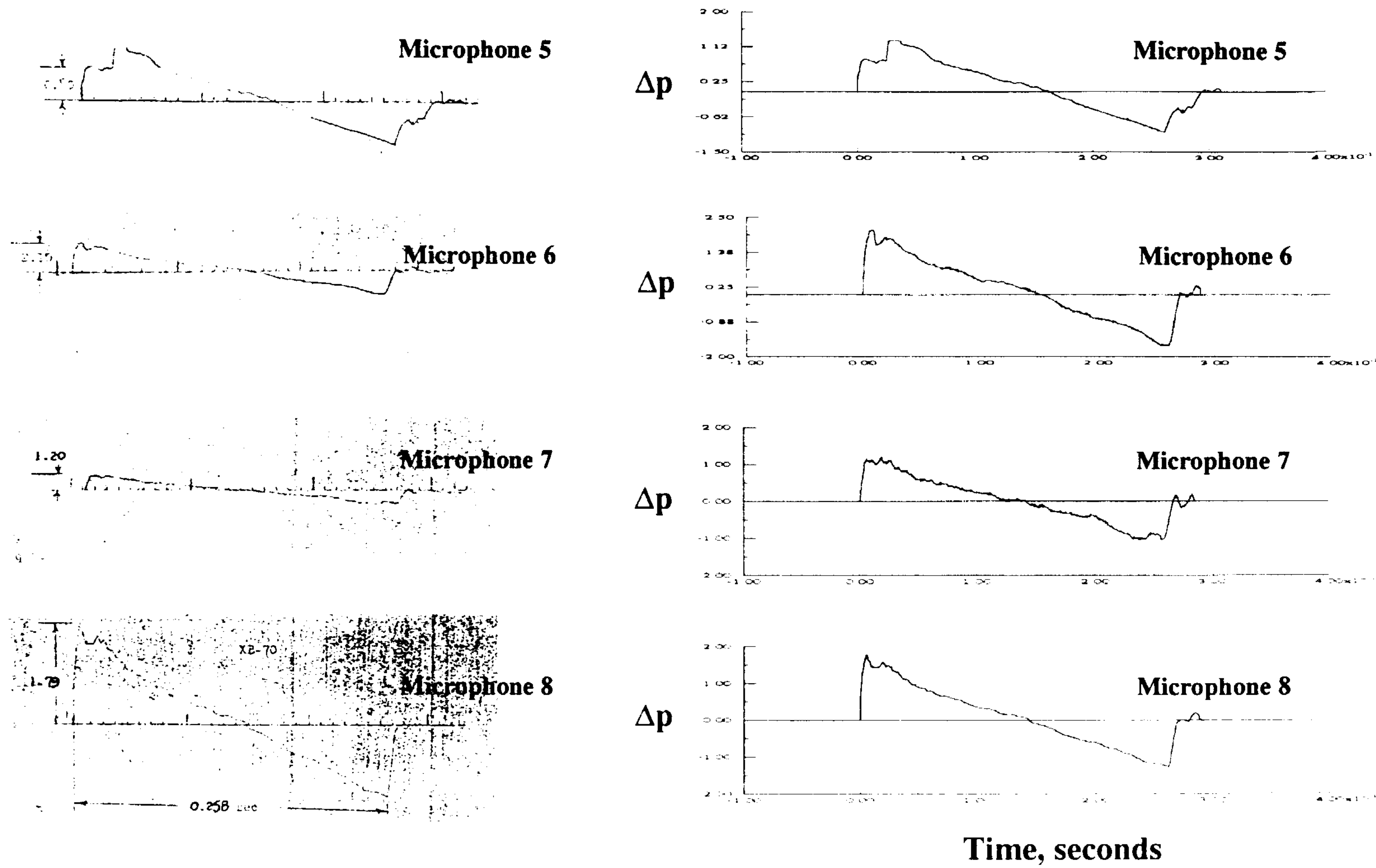
Figure 15.- Comparison of original and digitized sonic boom signature.



(a) original traces

(b) digitized traces

Figure 16.- Comparison of original sonic boom signatures from XB-70 #1 Flight #7 (DJM #1) with those produced using scanning and digitizing method.



(a) original traces

(b) digitized traces

Figure 16.- Concluded.

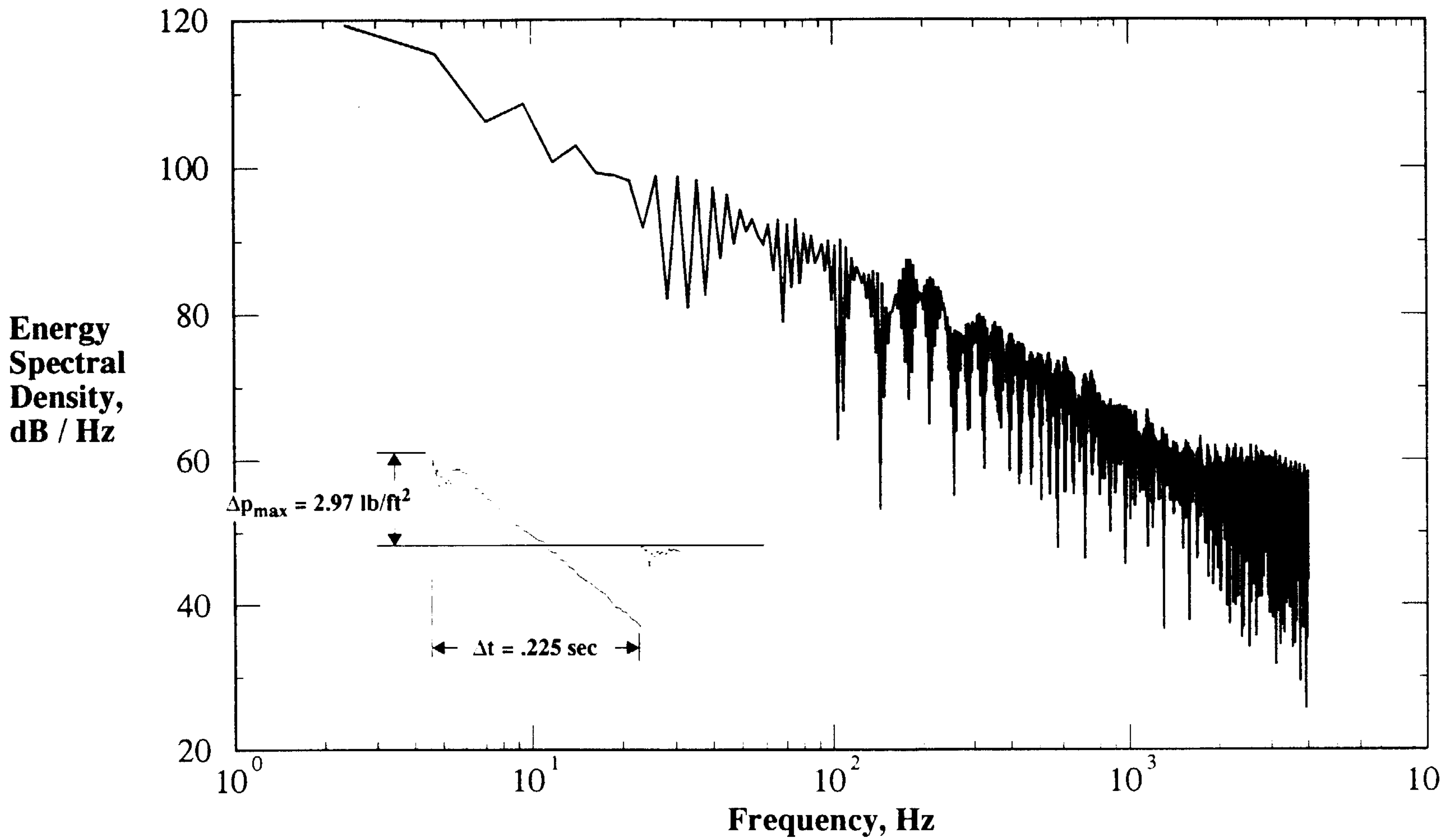


Figure 17.- Spectrum of digitized sonic boom signature. XB-70 #1 Flight #21 (DJM #16) microphone #1.

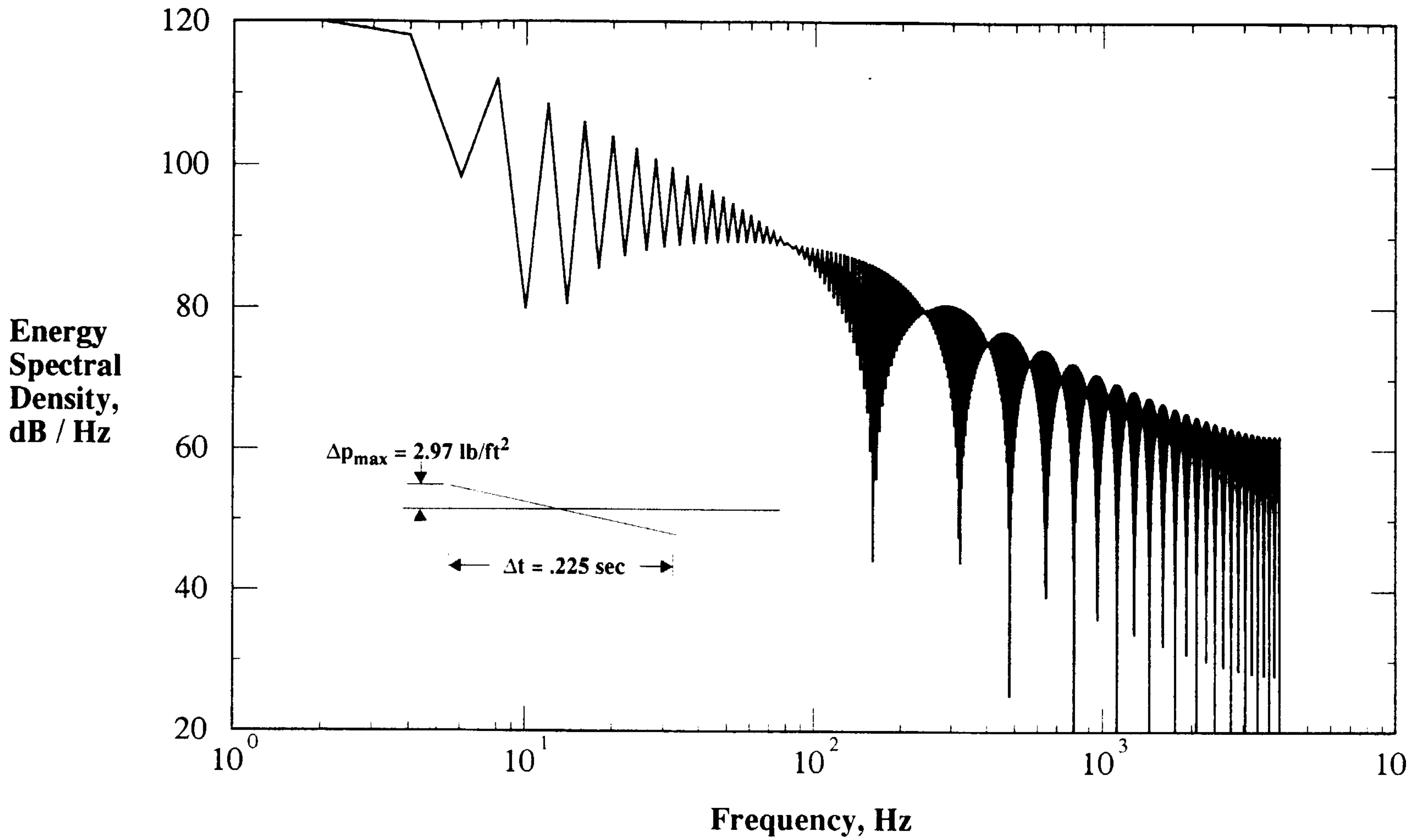
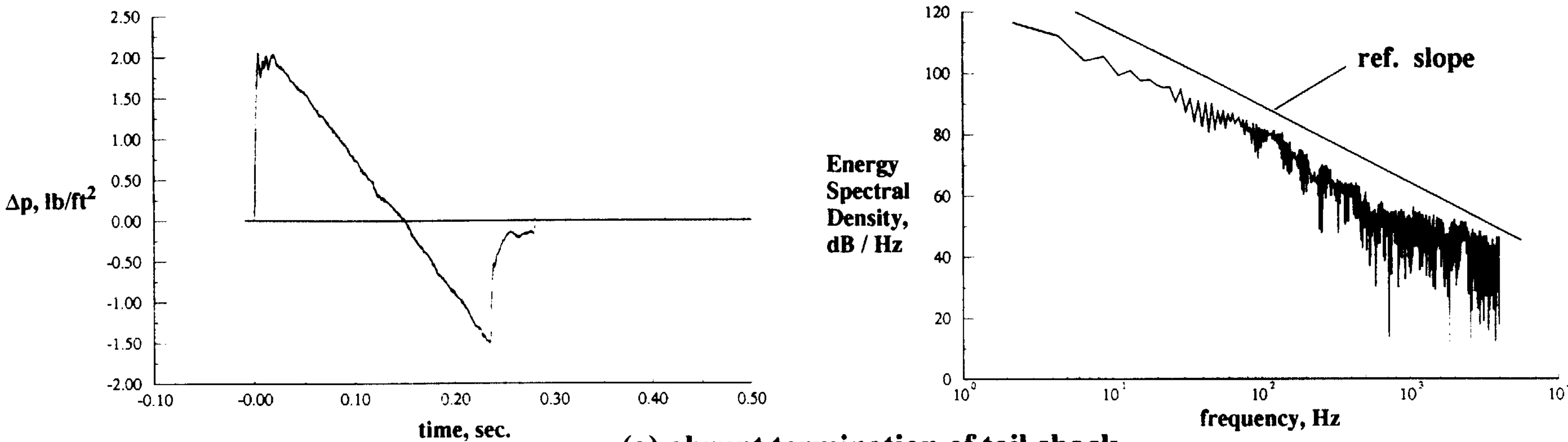
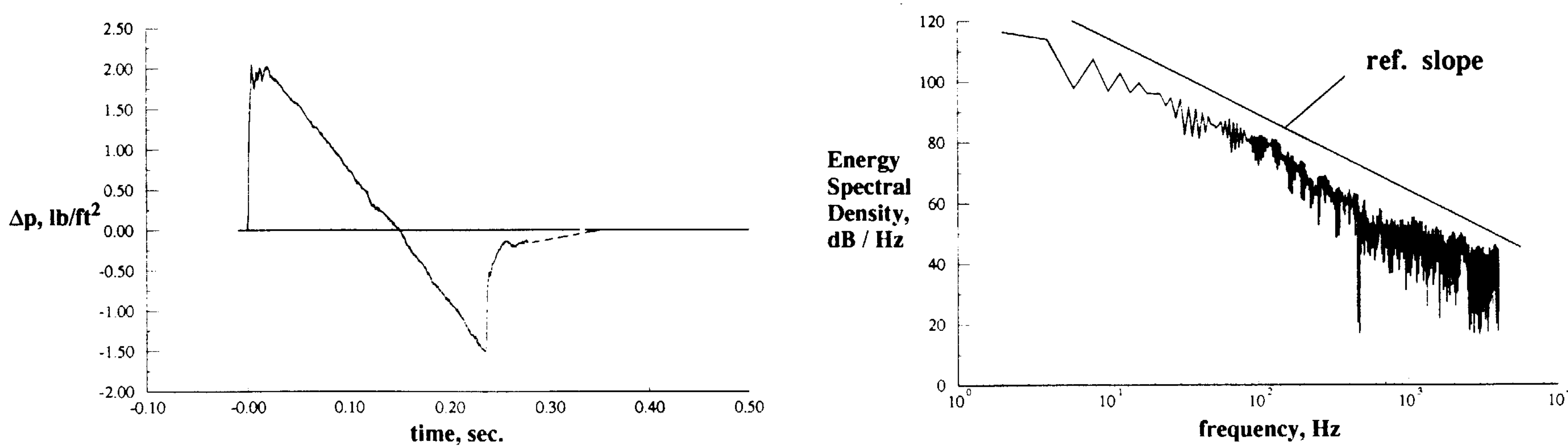


Figure 18.- Spectrum of N-wave sonic boom signature.

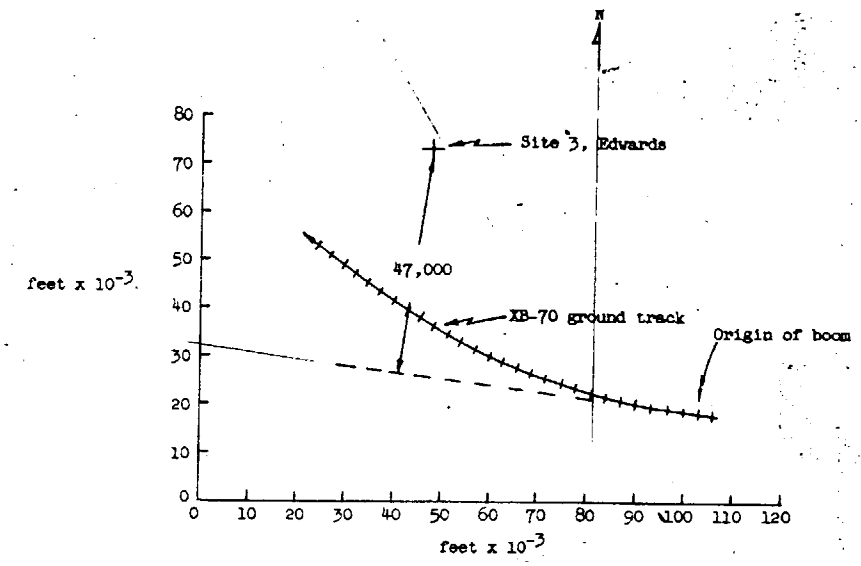


(a) abrupt termination of tail shock

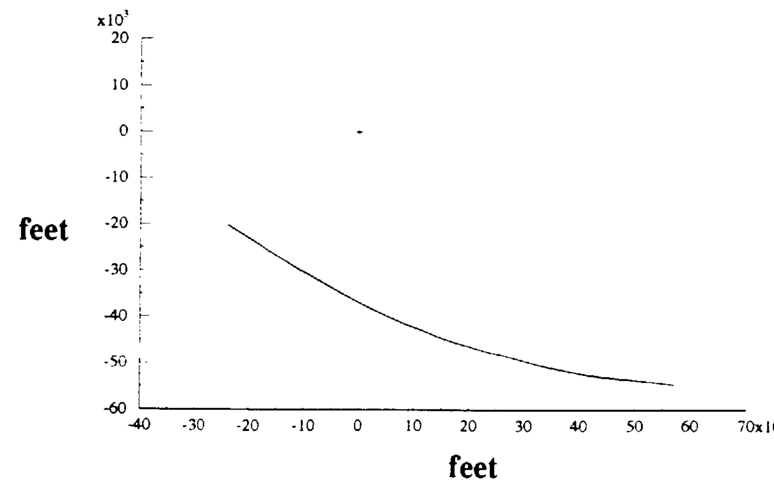


(b) gradual termination of tail shock

Figure 19.- Effect of abrupt cutoff of sonic boom signature trace following the recompression shock on spectrum shape. XB-70 #1 Flight #40 (DJM #33) microphone #6.

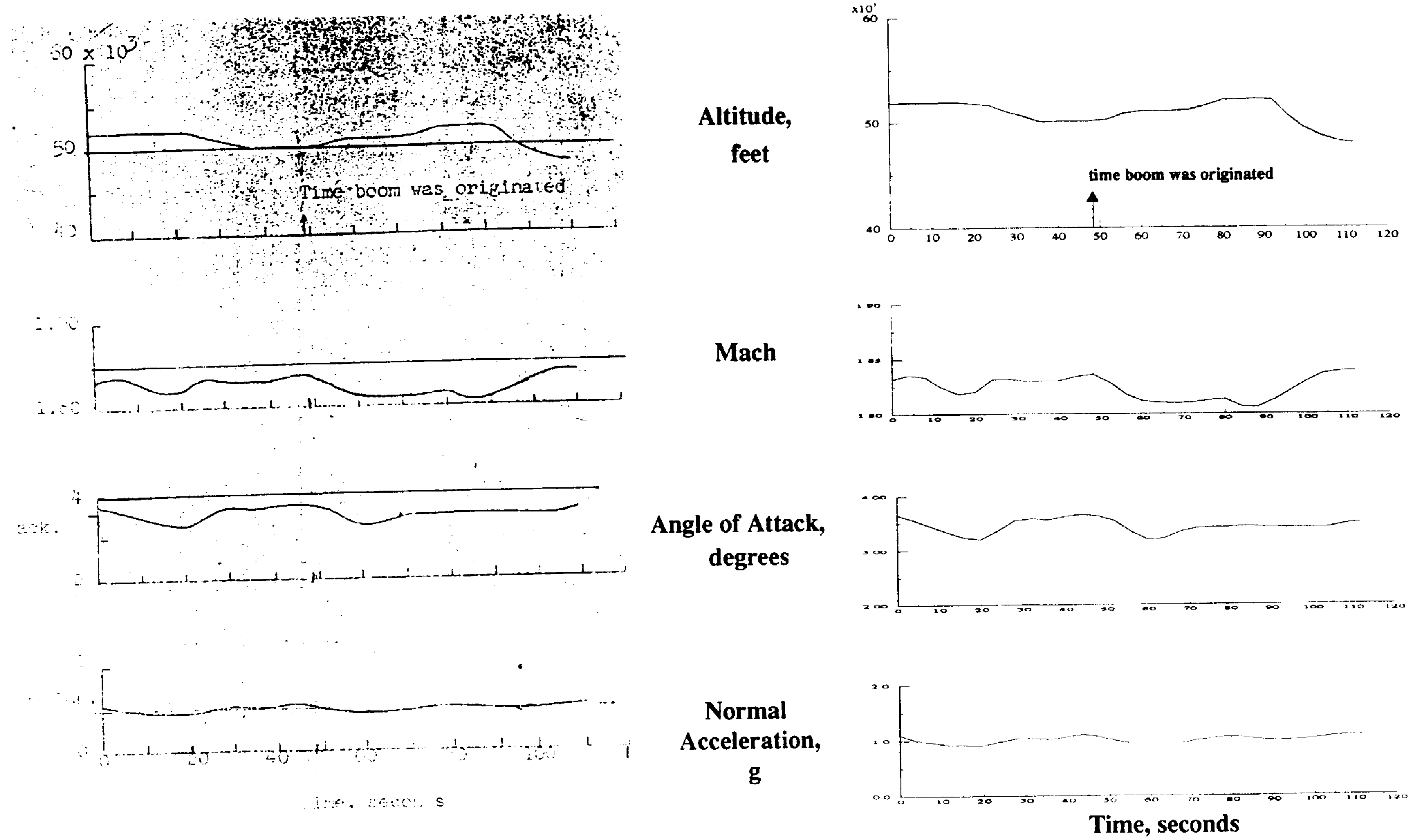


(a) original trace



(b) digitized trace

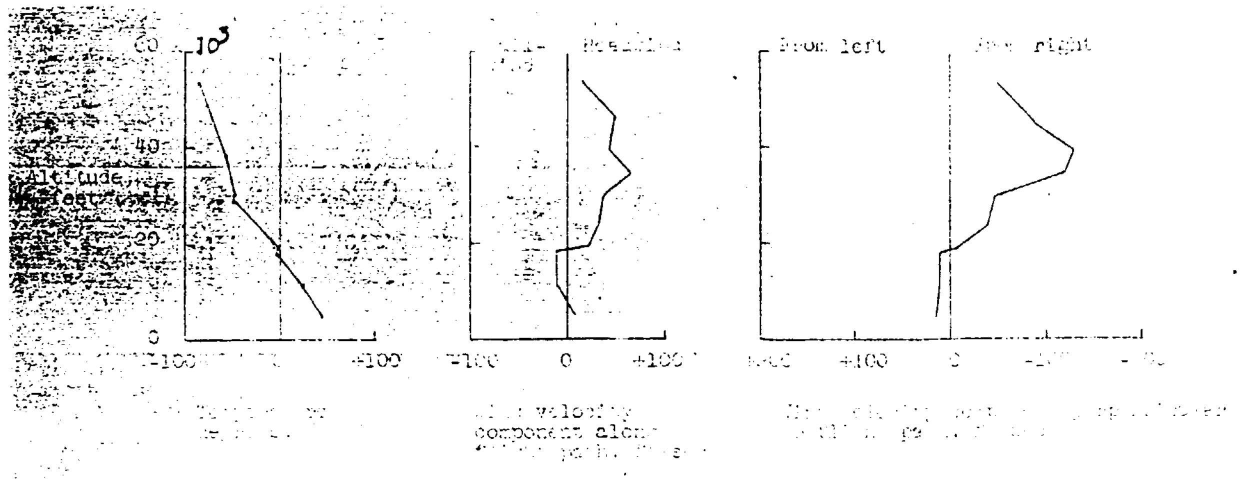
Figure 20.- Comparison of original aircraft ground track information for XB-70 #1 Flight #33 (DJM #27) with that produced using the scanning / digitizing method.



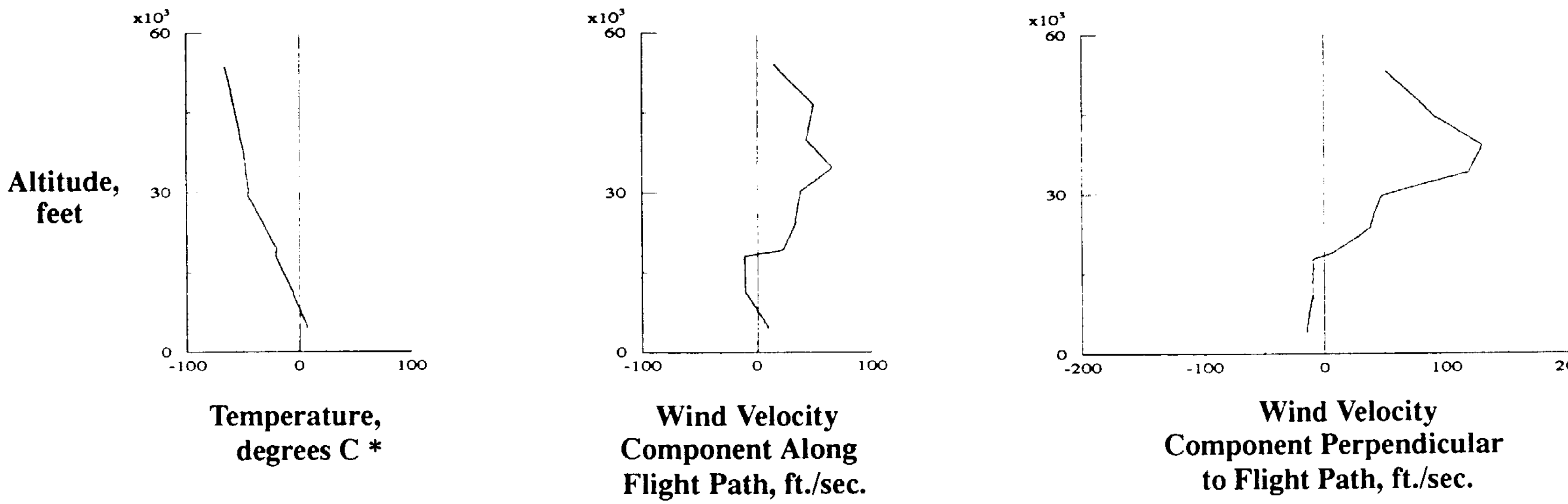
(a) original trace

(b) digitized trace

Figure 21.- Comparison of original onboard aircraft operating conditions for XB-70 #1 Flight #7 (DJM #1) with those produced using the scanning/ digitizing method.



(a) original traces



* Original temperature data for 40% of the reports was in Fahrenheit, data were converted to Celsius for consistency.

(b) digitized traces

Figure 22.- Comparison of original temperature and wing profiles associated with XB-70 #1 Flight #7(DJM #1) with those produced using the scanning/ digitizing method.

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13. ABSTRACT (*Maximum 200 words*)

This paper provides a compilation of measured sonic boom signature data derived from 39 supersonic flights (43 passes) of the XB-70 airplane over the Mach number range of 1.11 to 2.92 and an altitude range of 30,500 feet to 70,300 feet. These tables represent a convenient hard copy version of available electronic files which include over 300 digitized sonic boom signatures with their corresponding spectra. Also included in the electronic file is information regarding ground track position, aircraft operating conditions, and surface and upper air weather observations for each of the 43 supersonic passes.

In addition to the sonic boom signature data, this paper also provides a description of the XB-70 database that has been placed on electronic files along with a description of the method used to scan and digitize the analog/oscillograph sonic boom signature time histories. Such information is intended to enhance the value and utilization of the electronic files.

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