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NASA Global Atmospheric Sampling Program (GASP) Data Report for Tape VL0015, VL0016, VL0017, VL0018, VL0019, and VL0020

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NASA GLOBAL ATMOSPHERIC SAMPLING PROGRAM (GASP) DATA REPORT FOR TAPES VL0015 TO VL0020

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SUMMARY

Atmospheric trace constituents in the upper troposphere and lower stratosphere were measured, from March 1975 to June 1979 as part of the Global Atmospheric Sampling Program (GASP), using fully automated air sampling systems on board the NASA CV-990 research aircraft and four Boeing 747 airplanes in routine airline service.

This report is the 12th of a series of reports which describes the data currently available from GASP, including flight routes and dates, instrumentation, data processing procedures, and data tape specifications. In-situ measurements of atmospheric ozone, cabin ozone, carbon monoxide, particles, clouds, condensation nuclei, water vapor, filter samples, and related meteorological and flight information obtained during 1732 flights of airplanes N533PA, N4711U, N655PA, and VH-EBE from January 5, 1978 to October 9, 1978 are reported. These data are now available from the National Climatic Center, Asheville, North Carolina 28801. In addition to the GASP data, tropopause pressures obtained from time and space interpolation of National Meteorological Center (NMC) archived data for the dates of the flights are included.

INTRODUCTION

The objectives of the NASA Global Atmospheric Sampling Program are to provide baseline data of selected atmospheric constituents in the upper troposphere and lower stratosphere and to document and analyze these data to (1) provide a better understanding of the dynamics of the atmosphere in the region where commercial airliners fly, and (2) provide initial value boundary conditions for atmospheric models being used to assess potential adverse effects from aircraft exhaust emissions on the natural atmosphere.

The GASP program began in 1972 with a feasibility study of the concept of using commercial airliners in routine service to obtain atmospheric data. This program progressed from design, acquisition, and flight testing of hardware (refs. 1 to 8) to collecting global data on a daily basis. Fully automated GASP systems were operational, four at various times, from December 1974 to June 1979 on a United Airlines B747, two Pan American World Airways B747's, and a Qantas Airways of Australia B747. The GASP system design, the measurement instruments, the on-board computer for automatic control and data management, and system maintenance procedures are described in references 9 and 10. Analyses of GASP data are reported in references 11-28.

In addition to the ambient atmospheric constituent measurements, GASP began in March 1977 to make measurements of cabin ozone levels on airplanes N533PA and N4711U. These aircraft provided simultaneous measurements of cabin and ambient ozone on flights of varing duration,

and at different flight levels, geographical locations, and seasons (ref. 29-33). The Federal Aviation Administration (FAA) has recently issued a rule regarding acceptable levels of ozone in aircraft cabins (ref. 34).

This report is the 12th in a series of reports to announce the availability of GASP data on magnetic computer tape from the National Climatic Center, Asheville, North Carolina 28801. Data for March 1975 to December 1976 are archived on tapes VL0001-VL0008 (refs. 35 to 41). Data for January to September, 1977 are on tapes VL0010-VL0013 (refs. 42 and 43). Continuous record data obtained on Pan Am's Fiftieth Anniversary around-the-world-via-the-poles flight on October 28 to 31, 1977 are archived on tape VL0009 (ref. 44). Data from Pan Am N533PA and N655PA, United N4711U, and Qantas VH-EBE from October 3, 1977 to January 5, 1978, are archived on tape VL0014 (ref 45). Data from Pan Am N533PA from January 8, 1978 to October 5, 1978 are archived in tapes VL0015 and VL0016. Data from United N4711U from January 5, 1978 to October 6, 1978, are archived on tapes VL0017 and VL0018. Data from Qantas VH-EBE from January 5, 1978 to March 3, 1978 and from Pan Am N655PA from January 9, 1978 to May 2, 1978, are archived on tape VL0019. Data from Pan Am N655PA from May 16, 1978 to October 9, 1978 are archived on tape VL0020. For each of these tapes, the time periods covered and the GASP aircraft from which data are archived are identified in table I.

The success of the GASP of course depended on the dedicated effort of both government and contractor personnel. The NASA LeRC personnel listed below had primary responsibility for various aspects of the GASP system:

GASP instruments, and installation	- L. C. Papathakos
	- E. A. Lezberg
	- P. J. Perkins
Flight testing and CV-990 data	- D. C. Briehl
	- G. M. Reck
	- D. J. Gauntner
Constituent measurement instrumentation	- D. R. Englund
Aircraft data acquisition system	- T. W. Nyland
Ozone measurement	- M. W. Tiefermann
Cloud detector and particle measurement	- M. W. Tiefermann
	- T. W. Nyland
Condensation nuclei measurement	- T. W. Nyland
Carbon monoxide measurement	- T. J. Dudzinski
Water vapor measurement	- T. J. Dudzinski
Filter analysis; $SO_4^=$, NO_3^-, Cl^-, F^-	- D. A. Otterson
Filter analysis; ^7Be	- D. C. Liu
Filter system and data analysis	- E. A. Lezberg
	- F. M. Humenik
Data tape specification and formats	- F. P. Michaelis
Data reduction software	- J. E. Thompson
Data processing and analysis	- J. D. Holdeman

DATA ACQUISITION

For each GASP flight, data acquisition began on ascent through the 6 km altitude flight level and terminated on descent through 6 km. A complete GASP sampling cycle was 60 minutes, divided into twelve 5-min sampling segments. During alternate segments (at 10-min intervals), air sample data were recorded for all instruments. During the intervening segments the system was in one of six different calibration cycles to

allow for in-flight checks on instrument operation (if required). Whenever any calibration cycle was not needed for a given instrument, that instrument acquires air sample data during the segment. For normal GASP sampling, a 16-second recording was made at the end of each 5-minute sampling segment.

Cassette tapes, on which the data were recorded onboard the airplane in serial format, were transcribed to computer-compatible form for data reduction. At this stage, laboratory instrument calibration information required for data processing was included, redundant and nonusable data were removed, and the data were retranscribed to final form and units.

Detailed specifications and formats for the GASP data are given in appendix A. On the GASP archive tapes, the data are grouped by aircraft and identified by flights with the airports of departure and arrival designated by the standard three-letter airport code (ref. 46) listed in appendix B. Data for each flight begins with an FLHT record (table A-I) to provide flight identification information. This record is followed by a series of DATA records (table A-II), one for each recording made during the flight. Summary tabulations for tapes VL0015, VL0016, VL0017, VL0018, VL0019, and VL0020 showing the route, date, number of DATA records, and constituent data available for each flight are given in tables II through VII.

MEASUREMENTS

The air sample for the GASP measurements entered the airplane through two separate inlet probes mounted near the nose of the airplane (ref. 1). Isokinetic sampling was used for the light scattering particle instrument sample air. A second probe was used to duct sample air to the gaseous constituent measuring instruments and the filter (ref. 9).

Sample air for the gaseous constituent measuring instruments that required sample pressurization was provided by a diaphram pump. A flow rate of 14 liters per minute was maintained by the pump at 101.3 ±0.7 kPa. Pressurization resulted in increased instrument sensitivity and prevented cabin air from leaking into the sample lines. This pressure was held at altitude from 6-12.5 km by the pressure regulation system described in ref. 2. Components of the pressure regulation system were contained in a flow control unit. The pump was mounted in a separate unit which also contained relays and thermostats used for control and safety. Pressure switches protected the system from overpressure and underpressure.

For each in-situ constituent measurement, an instrument ID number is given in the FLHT record for each flight for which constituent data are available; otherwise, ID = 'M'. In addition, each measurement has an associated TAG in each DATA record. If TAG = 'M', data are not available for that record, and the data field has been set equal to zero.

Ozone

GASP ozone measurements were made using an ultraviolet absorption ozone photometer manufactured by Dasibi Environmental Corp. (ref. 47). With this instrument the concentration of atmospheric ozone is determined by measuring the difference in intensity of an ultraviolet

light beam which alternately passes through the sample gas and an ozone-free zero gas (generated within the instrument). The instrument output is digital, and the register is up-dated at the end of each (10 or) 20-second measuring cycle. All instruments were the 20 second update cycle type except as indicated in table VIII. The range of this instrument is from 3 to 20,000 ppbv (parts per billion by volume), with a sensitivity of 3 ppbv. The GASP ozone instrument and the accuracy of the measurement are described in detail in reference 48.

Prior to February 1977, GASP ozone instruments were checked (over the range 0 to 1000 ppbv) against an ozone generator which was calibrated at 1000 ppbv by the 1 percent neutral buffered potassium iodide (KI) method (ref. 49). Based on the average of these KI calibrations the GASP ozone instruments read the correct ozone concentrations of an air sample at 1 atmosphere pressure and 25 deg C when the span was set at 58200. Because of uncertainty regarding the KI procedure as a standard for ozone measurements (see ref. 50 and refs. therein), later calibrations were made by comparison with a commercial UV photometer maintained at Lewis as a transfer standard. This transfer standard was periodically (about every 6 months) calibrated against the Jet Propulsion Laboratory 5-meter path length UV photometer (ref. 50). With the span setting of the transfer standard and the GASP ozone instruments set at 58200, the JPL calibrations indicated that the GASP data were 9 percent high.

To preserve GASP data consistency and intercomparability, span settings were not readjusted. Thus all published GASP ozone data are 9 percent high compared with the JPL calibrations. This is a systematic difference, and can easily be corrected for if the KI method is determined to be incorrect, and another method such as the UV photometer is adopted as the standard. The stability of 10 GASP ozone instruments over a 12-month period was within 1 percent. The random error of the ambient ozone measurement is 3 percent of reading (silicone pump diaphragms were used for all data reported herein) or 3 ppbv, whichever is greater (ref. 48).

In-flight monitoring of the ozone instrument included measurement of the instrument zero by flowing the sample through a charcoal filter external to the instrument, and measurement of the electronic span setting and control frequencies. The instrument was not calibrated in-flight with an ozone calibration gas because of the difficulty of generating a precisely known ozone concentration in the flight system. Periodic checks for calibration consistency were performed in the laboratory.

The recalibration criteria adopted for the data reported herein was a calibration within 7 percent of the standard instrument. If an instrument did not meet this criteria upon removal from the aircraft, the data taken using the instrument is accompanied by an 'L' tag. Table IXa identifies the 'L' tagged data reported on VL0015, VL0016, and VL0018.

Ambient ozone measurement - The air sample is pressurized to nominally 100 kPa (1 atm) prior to measurement of the ozone level. The ozone readings are corrected for drift of the instrument zero by subtracting the most current zero-level reading. Sample pressure and temperature measurement are used to correct these ozone levels for the difference between sampling conditions and the laboratory conditions at which the instruments were calibrated (1 atmosphere at 25 deg C). Data are not reported if the pressure of the sample entering the ozone

instrument is less than aircraft cabin pressure.

The destruction of ozone in the tetrafluoroethylene (TFE) sample lines from the inlet probe to the instrument, and in the TFE-coated diaphragm pump was periodically measured on board the aircraft under conditions simulating operation in flight. The ozone mixing ratio at the probe inlet is expressed in terms of the measured ozone mixing ratio (O3m, in ppbv) as

$$O3 = (1+a)O3m \qquad (1)$$

with the constant a determined by a regression analysis on the appropriate destruction test data. For N533PA (VL0015 and VL0016) the ozone destruction corrections were made using (1+a) = 1.028. The ozone destruction corrections for N4711U (VL0017 and VL0018) were made using (1+a) = 1.037. For N655PA the ozone destruction corrections were made using (1+a) = 1.062 (VL0019 files 2 and 3, and VL0020). The corrections for VH-EBE (VL0019 file 1) were made using (1+a) = 1.082. The uncertainty in this approximation is $\pm$ 2 percent. The destruction constants used are given in the FLHT record for each flight (see table A-I).

In previous reports (refs. 36 to 41) a more complicated form of equation (1) was reported which accounted separately for destruction of ozone by thermal and wall effects (refs. 51 to 53). Although the percentage of the incoming ozone destroyed by wall effects decreases with increasing concentrations, the percentage of the incoming ozone destroyed by the thermal mechanism increases with increasing concentration. Since both mechanisms are most likely contributing to the system destruction, it is not surprising that the destruction data are approximated well with a linear relationship which gives a constant percentage destruction.

As mentioned above, reported ozone levels have been corrected for drift of the instrument zero, for differences in the densities between the sampling and laboratory conditions, and for ozone destruction in the sample lines and pump. The density ratio factor is given by RHOR in the DATA records. Ambient ozone data values (O3, in ppbv) reported have been calculated as follows:

$$O3 = (1+a)(RHOR)(O3r - O3z) \qquad (2)$$

where

O3z is the most current zero
O3r is the measured (uncorrected) ozone mixing ratio
RHOR = (101.325/PSAMPLE)(TSAMPLE/298.15)
where PSAMPLE is in kPa and TSAMPLE is in deg K
(1+a) is the destruction correction (see eq. (1))

Three ozone data values are reported in the DATA records (see table A-II). The reading at the time the recording is made is O3. The mean ozone level for the 128 seconds preceding the recording is O3A, and the standard deviation of the measured ozone levels for that period is O3S. Because for some DATA records O3 is available, but O3A and/or O3S are not, all three values are tagged separately. Note that during continuous recordings (MODE = 10, MODE = 12, TYPE = 'L', or TYPE = 'C') O3A = O3S = 0 and their respective tags are set equal to 'M'.

Cabin Ozone. - For the GASP measurement of cabin ozone, the air was drawn from a 0.62-cm-diam port, located about 1.5 m above the floor

on the wall of the staircase to the upper deck in the first class cabin. This port was extended about 0.62 cm from the wall surface to minimize drawing air from along the wall. About 6 m of 0.62-cm-diam TFE-coated tubing was used between this port and the analyzer.

Cabin ozone data are processed in a manner directly analogous to that used for the ambient ozone levels. That is, cabin ozone levels (O33, in ppbv) are calculated as follows:

$$O33=(CDENS)(O33r-O33z) \qquad (3)$$

where

O33z is the most current zero
O33r is the measured (uncorrected) ozone mixing ratio
CDENS = 97.926/PCABIN where PCABIN is in kPa, and an air sample temperature of 15 deg C has been assumed.

For both cabin and ambient measurements zero level data appear in calibration cycle 1, and are idenitified by a 'Z' tag. The density factor, CDENS or RHOR, is given in the DATA records for each observation, so that the raw data readings can be extracted and alternate processing schemes employed at the analysts' option.

Carbon Monoxide

The carbon monoxide measurement was made with an infrared absorption analyzer (Beckman Instruments, Inc.) using dual isotope fluorescence. In the dual isotope fluorescence technique, alternating pulses of IR radiation spectra from a single source are produced that are an exact match of the vibrational-rotational absorption bands of $C^{12}O^{16}$ and $C^{13}O^{16}$. These two IR radiation spectra are passed through a single air-sample chamber. The CO present in the air sample (98.9% of all naturally occuring carbon-monoxide is $C^{12}O^{16}$) will absorb the $C^{12}O^{16}$ radiation but not the $C^{13}O^{16}$ radiation. Thus the $C^{13}O^{16}$ radiation pulse is a reference against which the absorption of $C^{12}O^{16}$ can be measured. After passing through the air-sample chamber, the alternating radiation pulses are converted to electrical signals by a solid-state IR detector. Ratio comparison of the two signal levels yields a voltage corresponding to the CO concentration in the air sample.

The air sample, pressurized to 100 kPa (1 atm), passed through a dessicant cartridge to remove water vapor, and through a particulate filter before admission to the air-sample chamber. Inlet pressure and temperature were measured to permit correction for the difference between the sampling conditions and the laboratory conditions at which the instruments were calibrated (atmospheric pressure at 25 deg C). The analyzer zero-output level was monitored at 20-minute intervals by diverting the air sample through a heated Hopcalite scrubber to remove all traces of CO from the air sample. Carbon-monoxide concentrations were corrected for zero drift by subtracting the most current zero-output level as discussed below. The electronic gain of the analyzer was monitored once per hour.

Output of the analyzer is a linear 0 to 5 V dc signal corresponding to the CO level of the air sample. Sensitivity, adjusted during calibration, is 250 ppbv per volt. Limit of detectability is 20 ppbv. Because a change in analyzer ambient temperature causes a zero shift and because the data system cannot accept a negative voltage, the zero-output level is set at 2 V dc. Full scale output thus corresponds

to 750 ppbv for the nominal zero setting.

The analyzers were calibrated with CO in nitrogen gas mixtures obtained from the National Bureau of Standards. The CO content of these mixtures was accurately known so as to serve as NBS Standard Reference Materials. The lowest concentration of CO obtainable as an NBS/SRM was about 10 ppmv. Therefore, a precision flow blender was used to dilute this mixture with proportionate amounts of CO-free nitrogen to obtain sample flows in the range of 100 to 900 ppbv. Calibrations using the diluted NBS/SRM are estimated to be accurate to within ± 2 percent.

Early in the GASP program, calibrations were also performed with nitrogen cylinders whose CO content was determined from a comparison with an NBS/SRM calibration. The use of these span gases for calibration was discontinued in March 1978 because of the variability of the CO level over a period of time.

Each analyzer was calibrated prior to its installation in an airplane. A check on this calibration was performed on its removal to determine any change in sensivity. The error due to a change in analyzer sensivity ranged from 0 to ±3.1 percent, based on an average sensitivity determined from the calibrations during an installation interval. Uncertainty of the CO measurement was the result of cablibration errors, change in sensitivity between calibrations, and random fluctuation of the output signal. For the data reported herein, the measurement error ranges from ± 4 to ± 10 percent of reading due to calibration error and sensitivity change. The standard error due to random fluctuation of the output signal is ± 14 ppbv. The GASP CO measurement is described in detail in reference 54.

Carbon monoxide data are processed according to the following:

$$CO = 0.25(SENS)(RHOR)(COv-COz) \qquad (4)$$

where

COz is the most current zero (mv)
COv is the local CO voltage (mv)
RHOR is the density correction factor, see equ. (2)
SENS is a calibration factor (FLHT record) based on an average of measurements taken before and after installation and is a result of small changes in the optics and electronics of the instrument. For data obtained prior to March 1978 this factor was also used to account for the variability of the calibration gases used (see above).

During the course of each flight, the CO zero level may vary appreciably. Because the data reduction always uses the 'most current' value available, and new COz's are obtained at nominally 20-minute intervals, COz variations can introduce errors in the reported CO mixing ratios. For example, if the true CO mixing ratio is constant, a difference of 100 mv in two consecutive zeros would result in an error of up to 25 ppbv in the reported CO level. To assist in identifying data which may have a significant error due to zero level variation, any COz reading which differs from the previous zero by more than 100 mv has had the normal 'Z' tag replaced with a 'C' tag. CO data readings that occur between two zeros that differ by more than 200 mv have been edited out. Full scale data readings (COv=5000 mv) are identified with an 'F' tag.

Three carbon monoxide data values are reported in the DATA records (see table A-II). The reading at the time the recording was made is CO.

The mean carbon monoxide level for the 128 seconds preceding the recording is COA, and the standard deviation of the measured carbon monoxide levels for that period is COSD. Because for some DATA records CO is available, but COA and/or COSD are not, all three values are tagged separately. Note that during continuous recordings (MODE = 10 or 12, or TYPE = 'L' or 'C') COA = COSD = 0 and their respective tags are set equal to 'M'.

Water Vapor

Atmospheric water vapor was measured with a chilled mirror dew/frost-point hygrometer manufactured by EG & G International, Inc. The hygrometer consisted of an electronics package (power/control unit, PCU), and a thermoelectrically cooled mirror sensor remotely mounted at the aircraft skin. The hygrometer operated on the principle of a condensate formation on the mirror surface as the mirror was cooled to the dew/frost point temperature (DFPT) of the air sample. As the condensate forms, an optical bridge circuit detected the change in mirror reflectance and provides a proportional control signal to a thermoelectric cooler control circuit. The balance of the optical bridge occurred when a thin film of condensate was maintained on the mirror surface. Changes in DFPT was tracked by increasing or decreasing the cooler current in proportion to the thickness of the condensate. The ability to track DFPT change was about 1.5 deg C per second.

Mirror temperature was determined by a platinum resistance thermometer (PRT) embedded in the mirror. The PRT was part of a bridge network in a resistance-to-voltage circuit that provided a linear 0 to 5 volt output corresponding to a DFPT range of +20 to -80 deg C, i.e.

$$DFPTA = 20-20(DFPTv) \qquad (5)$$

where
DFPTA is in deg C, and
DFPTv is in volts

The sensor was bolted, inside the aircraft, to the aircraft skin. Sample air was brought in through a de-iced airscoop of the type used on B747 aircraft for measurement of air temperature. The air sample was directed through a constricted flow tube to limit flow rate to about 1 standard liter per minute, across the mirror surface, and exhausted through ports in the downstream side of the airscoop. Sample pressure closely approximates altitude pressure.

In addition to DFPT data, the hygrometer was periodically operated in three operation check modes; namely an automatic balance check (ABC), a thermoelectric cooler depression check (MAX COOL), and a DFPT-readout calibration check (PCU CAL) The ABC, activated once per hour, compensated for contamination buildup on the mirror surface and for ambient temperature effects on the sensor optical components. In the ABC mode the mirror was heated to drive off any condensation and the optical-control bridge circuit was balanced to null out any change in dry mirror reflectance. In the MAX COOL mode, maximum cooling current was applied to the thermoelectric cooler to determine cooling capability (depression) or the lowest measureable DFPT at that particular flight condition. Depression was dependent on aircraft skin temperature. In the PCU CAL mode a known fixed-value precision resistor was substituted in place of the mirror PRT to provide a known output to serve as a check on the accuracy and stability of the mirror temperature measuring

circuitry.

For the early installation intervals, the ABC, MAX COOL, and PCU CAL were each activated once per hour. The time for the hygrometer to reach equilibrium after ABC and MAX COOL was approximately ten minutes. Thus, data from the DATA modes immediately following these calibration cycles was invalid, and have been edited out. Since the ABC and MAX COOL were programmed to occur on consecutive calibration cycles, nominally twenty minute periods of "missing" data occur once each hour. In an attempt to avoid this data loss, and because little change was noted in the mirror temperature readout circuit as measured during the PCU CAL, a change was made to reduce the frequency of activation of the MAX COOL and PCU CAL modes. The result was only intermittently successful however, due to a problem with the control relay, and it was necessary to process all data assuming all cal modes were activated once per hour.

Water vapor data are reported as both dew-frost point temperature (DFPTA in deg C) and water vapor mixing ratio (WVMRA, in ppmw) in the DATA records (see table A-II). The latter was determined by first calculating the vapor pressure of water over ice at the DFPT, whence the water vapor mixing ratio, in ppmw, follows as:

$$WVMRA = (.622)(10^6)(PVAPOR/PAMB) \quad (6)$$

Whenever DFPTA was equal to or greater (warmer) than the static air temperature (SAT), DFTAGA = 'S' to indicate saturation. Data have been edited out whenever the indicated DFPTA was more than 10 percent warmer than SAT (in deg C) on the grounds that this would exceed maximum physically realistic supersaturated values (P. D. Falconer, ASRC; State University of New York at Albany, private communication).

As noted previously, a measure of the cooling capability of the hygrometer was obtained by MAX COOL depression checks performed once per flight. These MAX COOL DFPT data and their corresponding SAT values, have been used in a linear regression analysis to obtain the mean (DELT) and standard deviation (SD) of the depression as a function of SAT for each sensor. A 'K' tag has been applied to all DFPTA data values for which DFPTA = -80 deg C or DFPTA < (SAT-(|DELT|-SD)) to indicate that the data was at or near the maximum cooling capability of the instrument. One would expect this to occur most frequently during stratospheric flight where dry air is expected along with warming temperatures.

The GASP hygrometers were calibrated at the manufacturer's plant and at the Lewis Research Center (LeRC) by comparing their indicated DFPT's with that of a standard hygrometer. The manufacturer's standard hygrometer is a laboratory-type cooled-mirror instrument which has been calibrated at the National Bureau of Standards (NBS). The accuracy of this standard is within ±0.2 deg C for DFPT's above -40 deg C and within ±0.5 deg C for DFPT's between -40 deg C and -80 deg C. The calibration system at LERC used two standard instruments consisting of the same model hygrometer used by the vendor of the GASP hygrometer as a standard and a cooled-mirror hygrometer by a different company. This instrument had a remote sensor so that it could be operated within an environmental chamber with the GASP sensors. The accuracy of the LeRC standards was considered to be within ±0.7 deg C for DFPT'S above -40 deg C and within ±1.0 deg C for DFPT's between -40 deg C and -80 deg C. The use of cooled-mirror hygrometer as standards for calibration of other hygrometers is common practice. The accuracy of a proven design of

cooled-mirror hygrometer is surpassed only by the gravimetric train and calibrated two pressure generator techniques developed by the NBS.

An estimate of the GASP water vapor measurement uncertainty can be obtained by making the assumption that the only significant sources of error are 1) the uncertainty of the calibration standards, 2) the scatter in the GASP hygrometer calibration, and 3) the shift in calibration during flight use. The uncertainty of the calibration standards was estimated to be ±1 deg C. The scatter in the GASP hygrometer calibration was estimated to be ±1 deg C; this includes 80 percent of the calibrations before flight use. The uncertainty due to calibration shift with flight usage was taken as ±1 deg C. Data for which the calibration shift during flight use exceeded this amount is given in table IXb. A root-sum-square combination of these uncertainties yields an estimated uncertainty of ±1.7 deg C for the water vapor data reported herein except for the data called out in table IXb .

Cloud Detector and Light Scattering Particles

Flight test experience with the light-scattering particle counters (Royco Instruments, Inc) included in the GASP systems indicated that flight through clouds resulted in a significantly greater count of the largest size particles (D > 3 micrometers) than is obtained in clear air (see ref. 3). A simple cloud detector is thus available by observing the counting rate of the largest size particles. This signal is monitored for 256 seconds prior to each data recording. The time (in seconds) during which the cloud rate, CLDRT, is greater than a preset level, CLDHI, is interpreted as time in clouds (CLSEC; see table A-II). The CLDHI level was programmed on board the United airliner based on visual observation of a light haze, and corresponds to a local particle density (for D > 3 micrometers) of 66,000 particles/cubic meter. If CLSEC > 0, CLTAG = 'C'. If cloud data are not available, CLTAG = 'M'.

The number of cloud encounters (CLAYR; see table A-II) is also available. Whenever clouds were detected (CLDRT > CLDHI), this was interpreted as a continuous encounter until cloud-free air was detected. This determination required a second preset level, CLDLO. If n is the number of times that the cloud rate crosses CLDHI and CLDLO (or CLDLO and CLDHI) in succession, then CLAYR = (n+1)/2. For all GASP observations CLDLO was set at CLDHI/8.

Except for clouds, data from the light scattering particle counters were not reported prior to tape VL0009 due to a rather large uncertainty in the total particle count resulting from nonuniform illumination of the sample volume, and high noise-to-signal ratios on channels measuring particles less than 1.4 micrometers in diameter. However, in response to requests, and as a supplement to the time-in-clouds data, measured particle densities, in particles/ambient cubic meter, are reported for particles > 0.45, >1.4, and >3 micrometers in diameter. The latter channel is the one used by the cloud detector, although the particle densities are obtained over a 60 second sampling period[1], whereas the sampling time for the cloud detection is 256 seconds.

[1]Particle density data reported in files 1, 2, 3, and flights 1-16 of file 4 on tape VL0010 were obtained with an instrument which was modified to count for 30 seconds. These data were incorrectly processed assuming a 60 second sampling period, thus the data values reported are half of the correct value. These data should be multiplied by 2 in any analysis.

The particle density, PD(I), is determined from

$$PD(I) = (counts)(RPFLOM) \qquad (7)$$

where 1/RPFLOM is the volume flow through the instrument, in ambient cubic meters, during the sampling period.

The particle density data reported are subject to variations among instruments due to differences in illumination of the sample volume. Our preliminary indication is that the resultant difference in magnitude may be on the order of $\pm$ 1/2 cycle (X or / by a factor of 3). A detailed mapping of the sample volume light field has not been made for any of the instruments flown on GASP B747's nor has any attempt been made to correct or normalize the data. It should also be noted that the minimum detectable non-zero particle count (one count in the sampling period) is given by RPFLOM.

Particle density and cloud data are reported when available in the DATA record for each sampling period. There are no calibration cycles for this instrument, so all CYCLES are data. Since a prerecording sampling period is required for these measurements, data do not appear for continuous recordings (MODE = 10, or TYPE = 'L'). For all flights in which particle or cloud data are reported, the instrument ID number is given in the FLHT records, otherwise PCSID = PCEID = 'M'.

Condensation Nuclei

The condensation nuclei measurement was made with a modified commercial monitor purchased from Environment/One Corporation of Schenectady, N.Y. (ref. 55). Sample air, at a rate of 5 standard liters per minute, was brought from the GASP inlet probe to the monitor thru an 8 meter length of 17 mm I.D. stainless steel tubing. The sample was pressurized to cabin pressure in the monitor and then passed thru the monitor's detector system. The sample left the monitor and was exhausted from the airplane through the GASP system static overboard exhaust port.

The sample was pressurized to cabin pressure by use of a NASA designed and installed 'Air Piston' pressurization system. In this system, the sample was drawn into a length of tubing. The tubing was then backfilled with filtered cabin air, thereby trapping the sample at one end of the tube at cabin pressure. The trapped sample was drawn into the detector system for the actual measurement.

In the detector system, the pressurized sample first passed thru a humidifier and then into a cloud chamber. An adiabatic expansion process was caused to occur in the cloud chamber. This created conditions such that the particles act as nucleation sites for the formation of a water droplet cloud. The density of the cloud, assumed to be proportional to the number of particles present, was measured by use of a light attenuation measurement technique. The relationship between particle concentration and light attenuation is obtained thru calibration.

The sensitivity of the monitor detector system was set to 600 (particles/cm^3)/Volt at laboratory conditions which resulted in an approximate full scale range of 1000 particles/cm^3 at typical GASP flight conditions. (The data system had a 5 V full scale range.) Repeated calibrations indicated that the output was linear with

concentration and repeatable to within 10% of reading. The overall accuracy of a concentration measurement when including the pressurization system was estimated to be better than ±10% of a reading at concentrations greater than 100 particles/cm^3 for a given type of particle. Noise level on the monitor's output signal was equivalent to less than ±10 particles/cm^3 at flight conditions. The time constant (63% change) for a step change in inlet concentrations was 6 seconds and was primarily a function of electronic filtering.

A Pollak counter was used as the standard against which the condensation nuclei monitors were calibrated. Combustion products from the burning of cotton string were used as a source of particles for calibration. The monitor has been tested with other types of particles and has shown sensitivity shifts of as much as 25% dependent on particle type. In these tests, particles obtained from heated nichrome wire, atomized 1% NaCl solution and room airborne particles were used. More detailed information on the condensation nuclei measurement can be found in reference 55.

Four condensation nuclei data values are reported for each DATA record. CNC is the local value at the time of the recording; AVA is the average value over the 240 seconds prior to the recording; ATKMAX is the maximum, and ATKMIN is the minimum of the 12 descrete values used in calculating AVA. All condensation nuclei data values are tagged independently. For continuous recordings (MODE = 10 and 12, or TYPE = 'L' or 'C'), AVA, ATKMAX, ATKMIN are set equal to zero, and their respective tags are set equal to 'M'.

Reported condensation nuclei data, like the ozone and carbon monoxide data, are corrected for variations in the instrument zero by subtracting the most current zero level. For the CN instrument, these occur on all even cal cycles, and are reported in millivolts and are identified in the DATA records with a 'Z' tag. Full scale data readings, CNv = 5000 mv, are identified by a 'P' tag.

Condensation nuclei data are determined as

$$CNC = (DENS)(0.6)(CNv-CNz) \qquad (8)$$

where

CNv is the local CN voltage (mv)
CNz is the most current zero voltage (mv)

$$DENS = ((PAMB/10)/(PCABIN))(288.15/(SAT+273.15)) \qquad (9)$$

and

PAMB is in hPa (in table A-II)
PCABIN is in kPa
SAT is in deg C (in table A-II)

The published data obtained from the GASP condensation nuclei measurement system is corrected for the ratio of ambient to cabin air density (DENS in the DATA records) and is therefore the actual particle concentration external to the aircraft. Calculations indicate that diffusion losses which may occur in the 8 meter length of inlet tubing could amount to as much a 3%, 7%, and 45% of the particles present with diameters of 0.02, 0.01, and 0.002 micrometers respectively. No measurement of the actual losses occuring in the aircraft systems have been made and since the diameter composition of the particles being measured is unknown, no corrections for diffusion losses or sensitivity shifts are applied to the published data.

Filter Samples

Atmospheric concentration data for sulfates, nitrates, chlorides, fluorides, and ^{7}Be were provided by exposure and subsequent laboratory analysis of filter samples. Filter exposures were programmed to occur at altitudes greater than 9.6 kilometers on the first flight of every third calendar day, provided that an unexposed filter was available. Filters were normally exposed for 2 hours, although shorter exposures occurred if the aircraft desended to an altitude less than 9.6 kilometers before 2 hours had elapsed.

Filter data are included in the FLHT record (table A-I) for each flight. If an exposure occurs (FILEX = 'T'), and if data from the laboratory analysis are available (FDATA = 'T'), the date, time, altitude, and position for the beginning and end of the exposure period, the type of filter, and the constitutent data are reported. Filter data are summarized in table IX to XII. The data from the laboratory analysis are divided by the integrated filter flow (FFLO in table A-I), and data are reported as micrograms (or pico Curies)/ambient cubic meter.

Multifilter apparatus. - The multifilter apparatus was an enclosed slide mechanism which accommodated a filter magazine containing eight individual filter holders. Filter insertion, retraction, and advancement were automatic upon command from the GASP system control unit. Airflow for the apparatus was supplied from an external probe (25 mm diam) and expanded in the sampling duct (67 mm diam).

Filter preparation. - All filter exposures were made using IPC-1478 filter paper. This is a low resistance, cellulose type material made from second cut cotton linters with cotton scrim backing for added strength. This paper was specially designed for high altitude air sampling and features low pressure drop, high flow rate, and good retention for small airborne particles. This paper is impregnated with dibutoxyethylphthalate during manufacture to improve collection efficiency.

Prior to use, this paper must be washed to remove residual amounts of water soluble contaminants (ref. 56). A semiautomatic washing machine was available to process up to 25 filters at one time. An auxiliary tray was loaded with individual filters each sandwiched between stainless steel support screens. The washing procedure was as follows:

(a) Immerse filters in carbonate buffer solution (0.024M sodium carbonate and 0.030M sodium bicarbonate) and soak for 5-10 minutes.

(b) Rinse in deionized water about 3 times.

(c) Immerse in 0.1M acetic acid solution and soak for 3-5 minutes.

(d) Rinse in deionized water about 3 times.

(e) Wash filter group at least 4 times in automatic-cycling washer system using deionized water saturated with dibutoxyethylphthalate.

(f) Dry in washer chamber with clean filtered air warmed to 36-40 degrees C.

(g) Place filters in dessicator and vacuum dry overnight.

Samples from each wash group were analyzed for background levels of contamination to verify the washing procedure. Upon acceptance, the group of filters was transferred to a clean room for filter holder assembly and sealing. The filter holder assemblies were sealed in ultra-clean polyethylene bags to prevent contamination during shipping and handling. After filter exposure and removal from the aircraft, each magazine was rebagged and carefully repackaged for return shipment and analysis.

Filter analysis. - Prior to analysis, each filter was cut into four equal segments for separate constituent analysis, if necessary, and for comparative repeat analyses. Sulfate, nitrate, chloride, and fluoride ion concentrations were determined by ion chromatography. The basics of this analysis technique are described in references 57 to 59. This procedure requires wetting a filter segment with 10 ml of carbonate buffer (0.0024M sodium carbonate and 0.003M sodium bicarbonate) as the extracting solution. A 0.5-ml sample was injected into the ion chromatograph flow system, which includes a carbonate eluant background, an anion separator column, a suppressor column for anion conversion to its acid form, and a conductivity detector.

The instrument was calibrated using solutions with known concentrations of the various anions in the extractant. Calculations of the anion concentration were made by comparing the constituent peak heights from the sample chromatograms to those obtained with the standard calibrating solution. The fluoride ion identification is tentative because of interference with hydrolysis products of dibutoxyethylphthalate.

The net amount of any constituent on a filter was deduced by subtracting an average background level determined from several reference filter blanks which were removed from unexposed filter holder assemblies. The background levels in micrograms per filter were approximately 1.9 for sulfate, 7.7 for nitrate, 3.3 for chloride, and 3.3 for fluoride. No other adjustment for any contamination due to handling and shipping was made. A summary of the filter data on tapes VL0017 to VL0020 is provided in tables X to XIII. Additional information, including analyses of GASP filter data, is provided in reference 60.

Analysis for ^{7}Be. - GASP filter samples have been analysed for ^{7}Be since early 1978 at the Lewis Research Center. The filters have also been analysed for ^{7}Be at the New York State Department of Health, Division of Laboratories and Research, and ^{7}Be/ozone ratios are reported in reference 61. The ^{7}Be activities reported herein have been back calculated to the exposure date and reported as a concentration based an the integrated flow rate of air through the filter during the exposure period.

The interaction of cosmic rays with nitrogen, oxygen, and argon produces a large number of radioactive isotopes. Most of this production occurs in the stratosphere. Production rates have been estimated by Lai and Peters (ref. 62). The nuclides are easily oxidized and may be attached to small aerosol particles. ^{7}Be with a half life of 53.28 days has been demonstrated to be a useful natural radioactive tracer to identify stratospheric air (ref. 63). Although a significant amount can be produced in the upper troposphere, the much higher removal rates of aerosols from the troposphere compared to the stratosphere maintains a high specific activity ratio between stratosphere and

troposphere (ref. 64).

GASP filter samples were assayed for ^{7}Be by counting the 477 keV gamma-rays emitted from the ^{7}Be decay. Prior to March 1979 a Camberra '5%' Ge(Li) detector was used, and after that date a Princeton Gamma Tech '15%' Ge(Li) detector was used. The 5% and 15% designations are the detection efficiency values relative to a 7.62x7.62 cm NaI(Tl) detector.

Samples were normally counted for a period of 24 hours. There were exceptions: (1) the countings of some samples of relatively high ^{7}Be activities were stopped after about 8 hours of counting, and (2) some samples were counted over the weekend for as long as 72 hours.

Average errors based on counting statistics only are

±20% for samples > 0.1 nCi ^{7}Be

±30% for samples < 0.1 nCi ^{7}Be

In addition, systematic errors, including the uncertainty in the detection efficiency, may be ±10%.

FLIGHT AND METEOROLOGICAL DATA

In addition to the air sample measurements, aircraft flight data were obtained with each data recording to precisely describe conditions when the data were acquired. Aircraft position, heading, and the computed wind speed and direction were obtained from the inertial navigation system (INS). Altitude, air speed, and static air temperature were collected from the central air data computer (CADC) in the aircraft. Date and time were provided by a separate GASP clock-calendar unit. The above parameters were obtained once per DATA record. The vertical acceleration of the aircraft was obtained from the aircraft flight recording system at the rate of 8 per second which provided 32 data points for each DATA record. The formats and units for these data are given in table A-II.

The programming for the GASP systems initiated a continuous recording whenever the vertical acceleration of the airplane exceeded preset limits. This recording then continued until the acceleration remained within limits for 1 minute. These limits were set at 0.8 and 1.2 G's to correspond to "light-to-moderate" turbulence. Continuous recordings triggered by an acceleration limit are identified by TYPE = 'L', and the number of times (out of 32) that the acceleration exceeded the limits is given by NE (see table A-II). For any flight during which one or more limit recordings occurred, LIMCHK = 'T' in the FLHT record for that flight (see table A-I).

For each DATA record, the date, time, latitude, and longitude have been used to calculate the solar elevation angle (ref. 65). This is designated as ZEN in table A-II. Note that -90 deg < ZEN < +90 deg, where ZEN = +90 deg if the sun is directly overhead. The flight altitude was used to determine the solar elevation angle at sunrise and sunset, and day and night observations are identified by SUNTAG = ' ' and 'N' respectively. If GMT is not available for a given record (GMTTAG = 'M'), SUNTAG = 'M', and ZEN = 0.

The primary purpose of the flight and meteorological data is to

provide supporting information for the constituent measurements. However, these data, particularly the wind and temperature measurements, may be of interest even where constituent data are not available, and therefore have been reported for all GASP flights since mid-September 1976.

TROPOPAUSE PRESSURE DATA

The National Meteorological Center (NMC) is presently maintaining a library of gridded meteorological data fields. Among these are tropopause pressures, available on a twice daily basis (0000 and 1200 GMT), gridded into a 37 by 144 array for each hemisphere (2.5 deg intervals in both latitude and longitude).

The tropopause pressure corresponding to each GASP data location was obtained by time and space interpolation from the NMC arrays. These pressures and the corresponding geopotential heights for the standard atmosphere are included in the GASP DATA records (TRPRMB and TRPRHM in table A-II). For normal interpolations (within a 12 hour interval) TPTAG = ' '. If however, NMC data are missing for one reporting period such that the interpolation must be performed within a 24 hour interval, TPTAG = 'L'. If NMC data are missing for two or more consecutive reporting periods the time interpolation was not performed. In this case if the time of the GASP data point is within six hours of an NMC reporting period for which data are available, the space interpolated values at that reporting period are returned and TPTAG = 'E', but if the time of the GASP data point is not within six hours of an NMC reporting period for which data are available, TRPRMB = TRPRHM = 0, and TPTAG = 'M'. For GASP records in which the observation time is not available, 1200 GMT has been assumed for tropopause interpolation, and TPTAG = 'T'. Whenever tropopause pressure values are available, DELP = TRPRMB - PAMB, and DELHGT = ALTMAV - TRPRHM are also reported. Note therefore that positive values of DELP and DELHGT indicate stratospheric flight, and negative values correspond to flight in the troposphere.

Tropopause pressures in the NMC two-hemisphere arrays are determined by means of the Flattery global analysis method (ref. 66). This procedure makes use of the vertical temperature profiles calculated for each NMC grid point, and tests the slope of the profile curve upwards from the first mandatory pressure level. Although the two hemisphere arrays were not available prior to July 1977, the Flattery analysis scheme was used for tropopause pressures archived in the NMC 65 by 65 arrays prior to December 17, 1975. Tropopause pressures determined by this method have been shown previously to correlate well with GASP constituent data (refs. 11 to 18).

SUMMARY OF RESULTS

Atmospheric constituent data and related flight and meteorological data obtained during flights of GASP-equipped aircraft N533PA, N4711U, N655PA, and VH-EBE from January 5, 1978 through October 9, 1978 are now available. These data may be obtained on GASP tapes VL0015, VL0016, VL0017, VL0018, VL0019, and VL0020 from the National Climatic Center, Federal Building, Asheville, North Carolina 28801. Flight routes and dates, instrumentation, data processing procedures and data tape specifications and formats are discussed in this report.

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TABLE I - GASP DATA ON TAPES VL0001-VL0031

Tape	File	Aircraft	Dates	FLHT*	DATA+	Data**	Ref
VL0001	1	N655PA	3/11/75- 3/30/75	43	1919	O	35
VL0002	1	N4711U	3/23/75-10/21/75	159	7274	O,W1	36
VL0003	1	N655PA	5/02/75- 5/30/75	49	2173	O	37
VL0004	1	N4711U	12/26/75- 3/07/76	73	3572	O,W1,F,P	38
"	2	N655PA	1/22/76- 3/25/76	66	3757	O,F,B,P	38
VL0005	1	N4711U	3/29/76- 5/29/76	100	4892	O,W1,P	39
"	2	N655PA	3/25/76- 5/13/76	86	4716	O,B,P	39
"	3	N533PA	4/13/76- 6/13/76	28	2640	O,B	39
VL0006	1	N655PA	7/11/76- 9/26/76	131	8724	O,F,B,P	40
"	2	N533PA	7/08/76- 9/14/76	45	3594	O,B	40
"	3	VH-EBE	7/13/76- 8/31/76	69	3977	O,P	40
VL0007	1	N712NA	10/28/76-11/18/76	14	3481	O	41
"	2	N4711U	11/24/76-12/30/76	75	3756	O,F	41
"	3	N533PA	9/30/76- 1/02/77	146	13773	O,W1,P	41
VL0008	1	N655PA	10/15/76- 1/10/77	165	10122	F	41
"	2	VH-EBE	9/26/76- 1/09/77	286	15525	P	41
VL0009	1	N533PA	10/28/77-10/29/77	1	9162	O,C,A,P,Z	44
"	2	N533PA	10/29/77-10/29/77	1	8890	O,C,A,P,Z	44
"	3	N533PA	10/29/77-10/30/77	1	11487	O,C,A,P,Z	44
"	4	N533PA	10/30/77-10/31/77	1	9640	O,C,A,P,Z	44
VL0010	1	N533PA	1/21/77- 4/ 3/77	66	6586	O,W1,P	42
"	2	N533PA	4/ 6/77- 5/31/77	99	7355	O,C,P,Z	42
"	3	N533PA	6/ 1/77- 6/ 2/77	2	3633	O,C,P,Z	42
"	4	N533PA	6/ 3/77- 8/12/77	96	10643	O,C,P,Z	42
"	5	N533PA	8/13/77-10/ 4/77	73	7875	O,C,P	42
VL0011	1	VH-EBE	1/10/77- 2/28/77	127	6314	O,P	43
"	2	VH-EBE	3/15/77- 4/23/77	120	6807	O,C	43
"	3	VH-EBE	4/24/77- 6/18/77	144	6381	O,C	43
"	4	VH-EBE	6/18/77- 8/12/77	131	6264	O,C	43
"	5	VH-EBE	8/15/77-10/ 2/77	124	6094	O,C	43
VL0012	1	N4711U	1/ 3/77- 3/25/77	49	2181	O,F	42
"	2	N4711U	3/26/77- 6/13/77	102	4669	O,C,Z,F	42
"	3	N4711U	6/14/77- 7/26/77	93	4418	C,Z	42
"	4	N4711U	7/27/77- 9/20/77	110	4394	F	42
VL0013	1	N655PA	2/22/77- 4/ 9/77	84	4058		43
"	2	N655PA	4/15/77- 6/14/77	126	6084	O,C	43
"	3	N655PA	6/14/77- 7/ 8/77	73	3321	O	43
"	4	N655PA	7/ 8/77- 9/ 1/77	119	5555	F	43
"	5	N655PA	9/ 2/77-10/ 5/77	74	3273	F	43
VL0014	1	N533PA	10/ 4/77- 1/ 3/78	109	9718	O,W2,C,P,Z	45
"	2	N4711U	11/ 6/77- 1/ 5/78	138	5836	C,F,Z	45
"	3	N655PA	10/ 5/77-12/18/77	99	4824	O,C,P,F	45
"	4	VH-EBE	10/ 3/77-11/19/77	96	4334	O,C	45
"	5	VH-EBE	11/20/77- 1/ 4/78	120	5931	O,W2,C	45

TABLE I - GASP DATA ON TAPES VL0001-VL0031 CONCLUDED

Tape	File	Aircraft	Dates	FLHT*	DATA+	Data**
VL0015	1	N533PA	1/ 8/78- 3/ 1/78	81	9069	O,W2,C,P,A,Z
"	2	N533PA	3/ 2/78- 5/ 3/78	81	10895	O,W2,C,P,A,Z
"	3	N533PA	5/ 4/78- 6/21/78	84	8035	O,W2,P,A,Z
VL0016	1	N533PA	6/22/78- 8/14/78	111	9010	O,W2,Z
"	2	N533PA	8/ 1/78-10/ 5/78	102	9734	O,W2,Z
VL0017	1	N4711U	1/ 5/78- 3/20/78	160	14822	O,W2,F,C,Z
"	2	N4711U	3/22/78- 5/ 8/78	79	5932	O,W2,F,C,A,Z
"	3	N4711U	5/ 8/78- 6/23/78	108	5314	O,W2,F,C,P,A,Z
VL0018	1	N4711U	6/23/78- 8/11/78	123	9046	O,W2,F,C,P,A,Z
"	2	N4711U	8/11/78-10/ 6/78	70	5997	O,W2,F,C,P,A,Z
VL0019	1	VH-EBE	1/ 5/78- 3/ 4/78	160	9148	O,W2,C,A
"	2	N655PA	1/ 9/78- 3/ 6/78	82	3860	O,W2,F,C,A
"	3	N655PA	3/ 6/78- 5/ 2/78	128	6591	O,W2,F,C
VL0020	1	N655PA	5/16/78- 6/12/78	67	4158	O,W2,F,C,P,A
"	2	N655PA	6/13/78- 7/27/78	134	8225	O,F,C,P,A
"	3	N655PA	7/28/78-10/ 9/78	162	8226	O,W2,F,C,P,A
VL0021	1	N533PA	10/ 5/78-12/27/78	130	11770	O,W2,Z,H
"	2	N533PA	12/28/78- 2/22/79	96	10079	O,Z,H
"	3	N533PA	2/24/79- 5/10/79	75	8187	O,Z,H
VL0022	1	N533PA	5/31/79- 6/30/79	29	33365	O,H,Z
VL0023	1	N655PA	10/10/78-12/ 4/78	126	7904	O,W2,C,P,A,F
VL0024	1	N655PA	12/ 6/78- 2/23/79	151	26872	O,W2,C,P,A
VL0025	1	N655PA	2/24/79- 3/ 9/79	29	30449	O,W2,C,P,A
VL0026	1	N655PA	3/13/79- 5/ 8/79	132	7184	O,W2,C,P,A
"	2	N655PA	5/ 9/79- 6/ 7/79	85	4450	O,W2,C,P
VL0027	1	N4711U	10/ 7/78-12/ 7/78	90	31082	O,W2,C,P,A,Z,F
VL0028	1	N4711U	12/ 8/78- 1/29/79	106	28214	O,W2,C,P,A,Z,F
VL0029	1	N4711U	1/30/79- 3/14/79	97	26487	O,W2,C,P,Z,F
VL0030	1	N4711U	3/14/79- 4/ 7/79	48	19520	O,W2,P,Z
VL0031	1	N4711U	5/29/79- 7/12/79	106	24138	O,W2,P,Z,F
totals				6945	667385	

* Number of flights
\+ Number of DATA records
** Constituent measurements:

O - Ozone
W1 - Water vapor, aluminum oxide hygrometer
W2 - Water vapor, cooled mirror hygrometer
F - Filter data
B - Sample bottle data
C - Carbon monoxide
A - Condensation nuclei
P - Particles and/or clouds
Z - Cabin ozone
H - Cabin humidity

TABLE II - FLIGHTS ON GASP TAPE VL0015

A) FILE 1 (PANAM-N533PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
1	GP325	JFK-HND	1/ 8/78	1700-0546	148			P	A	Z	
2	"	HND-LAX	1/ 9/78	0817-1640	131			P	A	Z	
3	"	LAX-HND	1/ 9/78	2113-0703	114			P	A	Z	
4	"	HND-JFK	1/10/78	1057-2228	135			P	A	Z	
5	"	JFK-HND	1/11/78	1819-0729	155	W				Z	
6	"	HND-LAX	1/12/78	0947-1816	145					Z	
7	"	LAX-HND	1/12/78	2213-0813	119	W				Z	
8	"	HND-JFK	1/13/78	1041-2210	135	W		P	A	Z	
9	"	JFK-HND	1/14/78	1710-0547	165	W				Z	
10	"	HND-LAX	1/15/78	0810-1626	97						
11	"	LAX-HND	1/15/78	2130-0740	118			P	A		
12	"	HND-JFK	1/16/78	1025-2132	141	W		P	A	Z	
13	"	JFK-HND	1/17/78	1648-0542	151	W		P	A		
14	"	HND-LAX	1/18/78	0753-1611	107			P	A	Z	
15	"	LAX-SFO	1/18/78	1917-1947	6			P			
16	GP328	SFO-HKG	1/18/78	2322-1309	199	W		P	A	Z	
17	"	HKG-SIN	1/19/78	1525-1820	34	W				Z	
18	"	SIN-HKG	1/20/78	0109-0359	33			P	A	Z	
19	"	HKG-SFO	1/20/78	0648-1702	136	W		P	A	Z	
20	"	SFO-HKG	1/20/78	2257-1251	161	W		P	A	Z	
21	"	HKG-SIN	1/21/78	1541-1837	45	W				Z	
22	"	SIN-HKG	1/22/78	0106-0401	16	W				Z	
23	"	HKG-SFO	1/22/78	0702-1729	182	W				Z	
24	"	SFO-HKG	1/22/78	2335-1320	177	W				Z	
25	"	HKG-SIN	1/23/78	1540-1830	35	W				Z	
26	"	SIN-HKG	1/24/78	0100-0350	33					Z	
27	"	HKG-SFO	1/24/78	0649-1709	121	W				Z	
28	"	SFO-HKG	1/25/78	2316-1310	164	W					
29	"	HKG-SIN	1/26/78	1602-1857	35	W					
30	"	SIN-HKG	1/27/78	0108-0358	34	W		P			
31	"	HKG-SFO	1/27/78	0642-1712	121	O	C	P	A		
32	"	SFO-HKG	1/27/78	2305-1226	158	O	W	C	P	A	
33	"	HKG-SIN	1/28/78	1601-1855	50		W			A	
34	"	SIN-HKG	1/29/78	0108-0358	33	O	W	C			
35	"	HKG-SFO	1/29/78	0652-1713	123	O	W	C	P	A	
36	"	SFO-HKG	1/29/78	2315-1253	178		W				
37	"	HKG-SIN	1/30/78	1544-1834	34		W				
38	"	SIN-HKG	1/31/78	0108-0402	53						
39	"	HKG-SFO	1/31/78	0651-1712	120	O	W	C			
40	GP336	SFO-HKG	2/ 1/78	2258-1238	163	O	W	C			Z
41	"	HKG-SIN	2/ 2/78	1540-1843	58	O	W	C			Z
42	"	SIN-HKG	2/ 3/78	0105-0345	33	O		C			Z
43	"	HKG-SFO	2/ 3/78	0654-1701	134	O	W	C			Z
44	"	SFO-HKG	2/ 3/78	2313-1223	152	O	W	C			Z
45	"	HKG-SIN	2/ 4/78	1548-1843	36	O	W	C			Z

TABLE II - A) VL0015 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
46	GP336	SIN-HKG	2/ 5/78	0117-0406	80						Z
47	"	HKG-SFO	2/ 5/78	0715-1655	115		W				Z
48	"	SFO-HKG	2/ 5/78	2310-1242	176	O	W	C	P	A	Z
49	"	HKG-SIN	2/ 6/78	1541-1836	35		W				Z
50	"	SIN-HKG	2/ 7/78	0118-0358	32						Z
51	"	HKG-SFO	2/ 7/78	0731-1717	132	O	W	C			Z
52	"	SFO-LAX	2/ 8/78	1635-1655	36						
53	"	LAX-HND	2/ 8/78	2042-0704	119		W		P	A	Z
54	"	HND-JFK	2/ 9/78	1144-2329	134		W				Z
55	"	JFK-HND	2/10/78	1633-0511	159	O	W	C			Z
56	"	HND-JFK	2/11/78	1026-2149	133	O	W	C	P	A	Z
57	"	JFK-HND	2/12/78	1647-0542	150	O	W	C			Z
58	"	HND-LAX	2/13/78	0751-1606	95	O	W	C			Z
59	"	LAX-HND	2/13/78	2031-0654	122	O	W	C	P	A	Z
60	"	HND-JFK	2/14/78	1013-2148	132		W				Z
61	GP343	JFK-HND	2/15/78	1651-0505	142	O	W	C			Z
62	"	HND-LAX	2/16/78	0810-1615	93		W		P	A	Z
63	"	LAX-HND	2/16/78	2052-0727	123		W				Z
64	"	HND-JFK	2/17/78	1105-2233	160	O	W	C			Z
65	"	JFK-CTS	2/18/78	1652-0446	137		W	C	P	A	Z
66	"	CTS-HND	2/19/78	0838-0923	9	O	W				Z
67	"	HND-LAX	2/19/78	1321-2140	98	O	W	C			Z
68	"	LAX-HND	2/20/78	0151-1145	112		W				Z
69	"	HND-JFK	2/20/78	1356-0131	136	O	W	C			Z
70	"	JFK-HND	2/21/78	1652-0522	160	O	W	C			Z
71	"	HND-LAX	2/22/78	0752-1612	93	O	W	C			Z
72	"	LAX-HND	2/22/78	2024-0621	154		W				Z
73	"	HND-JFK	2/23/78	1016-2151	135		W				Z
74	"	JFK-HND	2/24/78	1632-0503	172	O	W	C			Z
75	"	HND-LAX	2/25/78	0801-1615	96		W				Z
76	"	LAX-HND	2/25/78	2041-0636	114	O	W	C			Z
77	"	HND-JFK	2/26/78	1034-2213	141	O	W	C			Z
78	"	JFK-HND	2/27/78	1630-0509	149	O	W	C			Z
79	"	HND-LAX	2/28/78	0752-1607	97	O	W	C			Z
80	"	LAX-HND	2/28/78	2030-0626	135	O	W	C			Z
81	"	HND-JFK	3/ 1/78	1026-2210	245	O	W	C			Z
					9069						

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei
- Z - Cabin Ozone

TABLE II - FLIGHTS ON GASP TAPE VL0015

B) FILE 2 (PANAM-N533PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
1	GP347	JFK-HND	3/ 2/78	1628-0448	141	O	W	C	Z
2	"	HND-LAX	3/ 3/78	0758-1632	101		W		Z
3	"	LAX-HND	3/ 3/78	2034-0641	129	O	W	C	Z
4	"	HND-JFK	3/ 4/78	1121-2257	165	O	W	C	Z
5	"	JFK-HND	3/ 5/78	1641-0516	147	O	W	C	Z
6	"	HND-LAX	3/ 6/78	0805-1640	102	O	W	C	Z
7	"	LAX-HND	3/ 6/78	2042-0647	117	O	W	C	Z
8	"	HND-JFK	3/ 7/78	1018-2153	173	O	W	C	Z
9	"	JFK-HND	3/ 8/78	1627-0502	178	O	W	C	Z
10	"	HND-LAX	3/ 9/78	0751-1626	101		W		Z
11	"	LAX-HND	3/ 9/78	2040-0653	118	O	W	C	Z
12	"	HND-JFK	3/11/78	0331-1447	127	O	W	C	Z
13	"	JFK-HND	3/11/78	1756-0636	145		W		Z
14	"	HND-LAX	3/12/78	0849-1714	99	O	W	C	Z
15	"	LAX-HND	3/12/78	2026-0706	124	O	W	C	Z
16	"	HND-JFK	3/13/78	1023-2158	151	O	W	C	Z
17	"	JFK-HND	3/14/78	1639-0522	145	O	W	C	Z
18	"	HND-LAX	3/15/78	0756-1646	103	O	W	C	Z
19	"	LAX-HND	3/15/78	2053-0738	158		W	C	
20	"	HND-JFK	3/16/78	1038-2207	153		W	C	
21	"	JFK-HND	3/17/78	1630-0520	149		W	C	
22	"	HND-LAX	3/18/78	0809-1659	104		W		
23	"	LAX-HND	3/18/78	2048-0708	117		W	C	
24	"	HND-JFK	3/19/78	1032-2135	149		W	C	
25	"	JFK-HND	3/23/78	1641-0526	150		W	C	
26	"	HND-LAX	3/24/78	0814-1643	99		W	C	
27	"	LAX-HND	3/24/78	2044-0647	133		W	C	
28	"	HND-JFK	3/25/78	1049-2215	194		W	C	
29	"	JFK-HND	3/26/78	1630-0449	159		W	C	
30	"	HND-LAX	3/27/78	0806-1640	120		W	C	
31	"	LAX-HND	3/27/78	2019-0635	131		W	C	
32	"	HND-JFK	3/28/78	1021-2151	194		W	C	
33	GP349	JFK-HND	3/29/78	1628-0521	163	O	W	C	Z
34	"	HND-LAX	3/30/78	0756-1636	115	O	W	C	Z
35	"	LAX-HND	3/30/78	2027-0629	166	O	W	C	Z
36	"	HND-JFK	3/31/78	1049-2202	142		W		Z
37	"	JFK-HND	4/ 1/78	1646-0529	149	O	W	C	Z
38	"	HND-LAX	4/ 2/78	0754-1609	95		W		Z
39	"	LAX-HND	4/ 2/78	2110-0749	138	O	W	C	Z
40	"	HND-JFK	4/ 3/78	1022-2202	135		W		Z
41	"	JFK-HND	4/ 4/78	1630-0505	146		W		Z
42	"	HND-LAX	4/ 5/78	0751-1621	158	O	W	C	Z
43	"	LAX-HND	4/ 5/78	2019-0706	221	O	W	C	Z
44	"	HND-JFK	4/ 6/78	1118-2243	136	O	W	C	
45	"	JFK-HND	4/ 7/78	1729-0629	154	O	W	C	

TABLE II - B) VL0015 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
46	GP353	HND-LAX	4/ 8/78	0844-1724	101	O	W	C			
47	"	LAX-HND	4/ 8/78	2201-0833	132	O	W	C	P		
48	"	HND-JFK	4/ 9/78	1124-2246	129		W		P		
49	"	JFK-HND	4/10/78	1652-0532	148		W				
50	"	HND-LAX	4/11/78	0759-1654	102		W				
51	"	LAX-HND	4/11/78	2036-0722	126		W				
52	"	HND-JFK	4/12/78	1046-2212	151		W				
53	GP355	JFK-HND	4/13/78	1635-0500	144	O	W	C			
54	"	HND-LAX	4/14/78	0832-1747	105	O	W	C			
55	"	LAX-HND	4/14/78	2026-0656	118		W				
56	"	HND-JFK	4/15/78	1013-2158	152		W				
57	"	JFK-HND	4/16/78	1631-0525	196	O	W	C			
58	"	HND-LAX	4/17/78	0752-1632	99	O	W	C			
59	"	LAX-HND	4/17/78	2029-0720	129		W				
60	"	HND-JFK	4/18/78	1020-2144	134	O	W	C			
61	"	JFK-HND	4/19/78	1638-0521	166		W				
62	"	HND-LAX	4/20/78	0810-1635	99		W		P		
63	"	LAX-HND	4/20/78	2104-0806	145		W				
64	"	HND-JFK	4/21/78	1153-2302	133		W				
65	"	JFK-HND	4/22/78	1634-0515	149	O	W	C			
66	"	HND-LAX	4/23/78	0844-1709	97	O	W	C			
67	"	LAX-HND	4/23/78	2020-0635	122		W				
68	"	HND-JFK	4/24/78	1038-2218	135	O	W	C			
69	GP358	JFK-HND	4/25/78	1630-0515	148	O	W	C			Z
70	"	HND-LAX	4/26/78	0800-1619	116		W	C			Z
71	"	LAX-HND	4/26/78	2017-0626	157		W				Z
72	"	HND-JFK	4/27/78	1032-2217	138		W				Z
73	"	JFK-HND	4/28/78	1628-0513	146		W		P	A	Z
74	"	HND-LAX	4/29/78	0828-1638	96		W				Z
75	"	LAX-HND	4/29/78	2034-0656	124		W		P	A	Z
76	"	HND-JFK	4/30/78	1217-0002	136		W		P	A	Z
77	"	JFK-HND	5/ 1/78	1534-0419	147		W		P	A	Z
78	"	HND-SFO	5/ 2/78	0646-1452	95		W		P	A	Z
79	"	SFO-LAX	5/ 2/78	1801-1826	6		W		P		Z
80	"	LAX-HND	5/ 2/78	2136-0828	136		W				Z
81	"	HND-JFK	5/ 3/78	1048-2213	144		W		P	A	Z
					10895						

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water vapor
- C - Carbon monoxide
- P - Particles and/or clouds
- A - Condensation nuclei
- Z - Cabin ozone

TABLE II - FLIGHTS ON GASP TAPE VL0015

C) FILE 3 (PANAM-N533PA)

	FLIGHT	ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
1	GP360	JFK-HND	5/ 4/78	1823-0653	142		W	P	A Z
2	"	HND-SFO	5/ 5/78	0859-1707	95		W	P	A Z
3	"	SFO-LAX	5/ 5/78	2051-2116	6		W	P	A Z
4	"	LAX-HND	5/ 5/78	2349-1004	119		W	P	A Z
5	"	HND-JFK	5/ 6/78	1320-0055	137		W	P	A Z
6	"	JFK-HND	5/ 7/78	1545-0426	160		W	P	A Z
7	"	HND-SFO	5/ 8/78	0642-1452	92		W		Z
8	"	SFO-LAX	5/ 8/78	1757-1827	7		W		Z
9	"	LAX-HND	5/ 8/78	2059-0701	134		W		Z
10	"	HND-ORD	5/ 9/78	1011-2136	135		W		Z
11	"	ORD-JFK	5/10/78	0251-0351	13		W		Z
12	"	JFK-HND	5/10/78	1551-0526	160		W		Z
13	"	HND-SFO	5/11/78	0727-1520	89		W		Z
14	"	SFO-LAX	5/11/78	1800-1825	6		W		Z
15	"	LAX-HND	5/11/78	2122-0758	122	O	W		Z
16	"	HND-JFK	5/12/78	1100-2201	143	O	W		Z
17	"	JFK-HND	5/13/78	1551-0416	147	O	W		Z
18	"	HND-SFO	5/14/78	0706-1501	96	O	W		Z
19	"	SFO-LAX	5/14/78	1757-1824	22				Z
20	"	LAX-HND	5/14/78	2114-0724	117	O			Z
21	"	HND-JFK	5/15/78	1027-2213	136				Z
22	GP369	JFK-HND	5/16/78	1551-0406	141		W		Z
23	"	HND-SFO	5/17/78	0658-1523	98	O	W	P	Z
24	"	SFO-LAX	5/17/78	1802-1827	6		W		Z
25	"	LAX-HND	5/17/78	2058-0708	120	O	W	P	Z
26	"	HND-JFK	5/18/78	1036-2210	132		W		Z
27	"	JFK-HND	5/19/78	1545-0441	164	O	W	P	Z
28	"	HND-SFO	5/20/78	0704-1519	96	O	W	P	Z
29	"	SFO-LAX	5/20/78	1758-1826	47	O	W	P	Z
30	"	LAX-AKL	5/21/78	0559-1818	141	O	W	P	Z
31	"	AKL-SYD	5/21/78	2021-2239	44	O	W	P	Z
32	"	SYD-AKL	5/22/78	0258-0458	23	O	W	P	Z
33	"	AKL-LAX	5/22/78	0717-1822	162	O	W	P	Z
34	"	LAX-AKL	5/23/78	0553-1801	191	O	W	P	Z
35	"	AKL-SYD	5/23/78	2212-2222	3	O	W		Z
36	"	SYD-AKL	5/24/78	0252-0443	22	O	W	P	Z
37	"	AKL-NAN	5/24/78	0711-0854	14	O	W	P	Z
38	"	NAN-LAX	5/24/78	0918-1746	97	O	W	P	Z
39	"	LAX-SFO	5/24/78	2006-2029	10	O	W	P	Z
40	"	SFO-HKG	5/24/78	2348-1321	164	O	W	P	Z
41	"	HKG-SFO	5/26/78	0823-1900	134	O		P	Z
42	"	SFO-HKG	5/26/78	2343-1258	155	O		P	Z
43	"	HKG-SIN	5/27/78	2241-0123	49	O		P	Z
44	"	SIN-HKG	5/28/78	0304-0554	34	O		P	Z
45	"	HKG-SFO	5/28/78	0755-1911	132	O		P	Z

TABLE II - C) VL0015 FILE 3 CONTINUED....

	FLIGHT	ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
46	GP369	SFO-HKG	5/29/78	0007-1350	158	O	W	P	Z
47	"	HKG-SIN	5/29/78	1548-1817	28	O	W	P	Z
48	"	SIN-HKG	5/30/78	0109-0329	28	O	W	P	Z
49	"	HKG-SFO	5/30/78	0625-1745	132	O	W	P	Z
50	GP371	SFO-AKL	6/ 1/78	0740-1925	166	O	W		Z
51	"	AKL-SYD	6/ 1/78	2154-0019	45	O	W		Z
52	"	SYD-LAX	6/ 2/78	0540-1833	224	O	W		Z
53	"	LAX-AKL	6/ 3/78	0556-1755	155	O	W		Z
54	"	AKL-SYD	6/ 3/78	1952-2212	26	O	W		Z
55	"	SYD-MEL	6/ 4/78	0009-0039	7	O	W		Z
56	"	MEL-SYD	6/ 4/78	0304-0330	6		W		Z
57	"	SYD-LAX	6/ 4/78	0534-1751	159	O	W		Z
58	"	LAX-JFK	6/ 4/78	2142-0137	47	O	W		Z
59	"	JFK-BAH	6/ 5/78	2323-1029	130	O	W		Z
60	"	BAH-JFK	6/ 7/78	2135-0951	147	O	W		Z
61	"	JFK-LAX	6/ 8/78	2351-0420	53	O	W		Z
62	"	LAX-AKL	6/ 9/78	0712-1900	136	O	W		Z
63	"	AKL-SYD	6/ 9/78	2102-2332	29	O	W		Z
64	"	SYD-AKL	6/10/78	0256-0451	57	O	W		Z
65	"	AKL-LAX	6/10/78	0701-1825	177	O			Z
66	"	LAX-NRT	6/10/78	2125-0735	130	O	W		Z
67	"	NRT-JFK	6/11/78	1022-2137	129	O	W		Z
68	"	JFK-NRT	6/12/78	1545-0355	144	O	W		Z
69	"	NRT-SFO	6/13/78	0702-1452	91	O			Z
70	"	SFO-LAX	6/13/78	1810-1835	6	O	W		Z
71	"	LAX-NRT	6/13/78	2105-0738	141	O	W		Z
72	"	NRT-JFK	6/14/78	1028-2146	149	O	W		Z
73	"	JFK-LAX	6/15/78	0125-0600	53	O	W		Z
74	"	LAX-NRT	6/15/78	2148-0748	116	O	W		Z
75	"	NRT-JFK	6/16/78	1045-2136	140	O	W		Z
76	"	JFK-NRT	6/17/78	1608-0448	164	O	W		Z
77	"	NRT-SFO	6/18/78	0710-1530	98	O	W		Z
78	"	SFO-LAX	6/18/78	1823-1848	6	O	W		Z
79	"	LAX-LHR	6/18/78	2119-0614	102	O	W		Z
80	"	LHR-AMS	6/19/78	0819-0834	4	O	W		Z
81	"	AMS-LHR	6/19/78	1058-1108	3	O	W		Z
82	"	LHR-LAX	6/19/78	1330-2325	110	O	W		Z
83	"	LAX-NRT	6/20/78	2131-0720	148		W		Z
84	"	NRT-JFK	6/21/78	1039-2159	134	O	W		Z
					8035				

\+ Number of DATA records
** Constituent measurements: O - Ozone
A - Condensation Nuclei
W - Water vapor
P - Particles and/or Clouds
Z - Cabin Ozone

TABLE III - FLIGHTS ON GASP TAPE VL0016

A) FILE 1 (PANAM-N533PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
1	GP377	JFK-LAX	6/22/78	0217-0659	57		W	Z
2	"	LAX-NRT	6/22/78	2057-0647	110	O	W	Z
3	"	NRT-JFK	6/23/78	1016-2126	156	O	W	Z
4	"	JFK-NRT	6/24/78	1549-0419	148	O	W	Z
5	"	NRT-SFO	6/25/78	0657-1522	98	O	W	Z
6	"	SFO-LAX	6/25/78	1823-1848	6	O	W	Z
7	"	LAX-LHR	6/25/78	2104-0549	101	O	W	Z
8	"	LHR-AMS	6/26/78	0744-0756	19	O	W	Z
9	"	AMS-LHR	6/26/78	1039-1049	3	O	W	Z
10	"	LHR-LAX	6/26/78	1337-2337	119	O	W	Z
11	"	LAX-AKL	6/27/78	0620-1800	138	O	W	Z
12	"	AKL-SYD	6/27/78	2001-2226	30	O	W	Z
13	"	SYD-AKL	6/28/78	0433-0633	24	O	W	Z
14	"	AKL-LAX	6/28/78	0841-1945	127	O	W	Z
15	"	LAX-JFK	6/28/78	2315-0310	47	O	W	Z
16	"	JFK-NRT	6/29/78	1537-0430	168	O	W	Z
17	"	NRT-SFO	6/30/78	0647-1502	95	O	W	Z
18	"	SFO-LAX	6/30/78	1814-1834	5		W	Z
19	"	LAX-LHR	6/30/78	2118-0608	106	O	W	Z
20	"	LHR-AMS	7/ 1/78	0806-0816	3		W	
21	"	AMS-LHR	7/ 1/78	1126-1136	3	O	W	Z
22	"	LHR-LAX	7/ 1/78	1337-2332	120	O	W	Z
23	"	LAX-AKL	7/ 2/78	0708-1903	144	O	W	Z
24	"	AKL-SYD	7/ 2/78	2107-2343	63	O	W	Z
25	"	SYD-AKL	7/ 3/78	0306-0451	22	O	W	Z
26	"	AKL-LAX	7/ 3/78	0711-1806	132	O	W	Z
27	"	LAX-LHR	7/ 3/78	2316-0806	107	O	W	Z
28	"	LHR-AMS	7/ 4/78	1026-1031	2			
29	"	AMS-LHR	7/ 4/78	1304-1314	3	O		Z
30	"	LHR-LAX	7/ 4/78	1618-0221	138	O	W	Z
31	"	LAX-NRT	7/ 5/78	2201-0746	117	O	W	Z
32	"	NRT-JFK	7/ 6/78	1139-2249	135	O	W	Z
33	"	JFK-NRT	7/ 7/78	1547-0352	146	O	W	Z
34	"	NRT-SFO	7/ 8/78	0648-1503	100	O	W	Z
35	"	SFO-LAX	7/ 8/78	1810-1830	5	O		Z
36	"	LAX-LHR	7/ 8/78	2123-0603	105	O	W	Z
37	"	LHR-AMS	7/ 9/78	0806-0816	3	O	W	Z
38	"	AMS-LHR	7/ 9/78	1111-1121	3	O	W	Z
39	"	LHR-LAX	7/ 9/78	1407-0002	119	O	W	Z
40	"	LAX-LHR	7/10/78	2111-0626	112	O	W	Z
41	"	LHR-AMS	7/11/78	0810-0815	2		W	
42	"	AMS-LHR	7/11/78	1111-1116	2			
43	"	LHR-LAX	7/11/78	1353-2353	120	O	W	Z
44	"	LAX-JFK	7/12/78	2109-0104	48	O	W	Z
45	"	JFK-NRT	7/13/78	1535-0355	148	O	W	Z

TABLE III - A) VL0016 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	GP377	NRT-SFO	7/14/78	0648-1523	104	O	W	Z
47	GP383	SFO-LAX	7/14/78	1807-1832	6	O		Z
48	"	LAX-LHR	7/14/78	2142-0642	109	O		Z
49	"	LHR-AMS	7/15/78	0954-1004	3	O		Z
50	"	AMS-LHR	7/15/78	1218-1223	2			
51	"	LHR-LAX	7/15/78	1502-0057	117	O		Z
52	"	LAX-AKL	7/16/78	0654-1849	158	O		Z
53	"	AKL-SYD	7/16/78	2100-2315	28	O		Z
54	"	SYD-AKL	7/17/78	0254-0444	57	O		Z
55	"	AKL-LAX	7/17/78	0657-1822	138	O		Z
56	"	LAX-NRT	7/17/78	2115-0710	182	O		Z
57	"	NRT-JFK	7/18/78	1016-2141	138	O		Z
58	"	JFK-NRT	7/19/78	1544-0428	173	O		Z
59	"	NRT-SFO	7/20/78	0642-1446	98	O		Z
60	"	SFO-LAX	7/20/78	1805-1825	5	O		Z
61	"	LAX-LHR	7/20/78	2029-0504	105	O		Z
62	"	LHR-AMS	7/21/78	0746-0755	18	O		Z
63	"	AMS-LHR	7/21/78	1055-1100	2			
64	"	LHR-LAX	7/21/78	1332-2332	141	O		Z
65	"	LAX-AKL	7/22/78	0637-1834	159	O		Z
66	"	AKL-SYD	7/22/78	2032-2327	36	O		Z
67	"	SYD-MEL	7/23/78	0121-0156	8	O		Z
68	"	MEL-SYD	7/23/78	0316-0341	6	O		Z
69	"	SYD-LAX	7/23/78	0539-1749	147	O		Z
70	"	LAX-NRT	7/23/78	2114-0654	117	O		Z
71	"	NRT-JFK	7/24/78	1201-2311	135	O		Z
72	"	JFK-NRT	7/25/78	1536-0356	151	O		Z
73	"	NRT-SFO	7/26/78	0710-1520	99	O		Z
74	"	SFO-LAX	7/26/78	1810-1825	4	O		Z
75	"	LAX-LHR	7/26/78	2106-0621	112	O		Z
76	"	LHR-AMS	7/27/78	0811-0816	2			
77	"	AMS-LHR	7/27/78	1049-1053	2			
78	"	LHR-LAX	7/27/78	1333-2300	132	O		Z
79	"	LAX-AKL	7/28/78	0621-1757	158	O		Z
80	"	AKL-SYD	7/28/78	2017-2237	29	O		Z
81	"	SYD-AKL	7/29/78	0254-0452	35	O		Z
82	"	AKL-LAX	7/29/78	0711-1829	134	O	W	Z
83	"	LAX-NRT	7/29/78	2135-0650	114	O	W	Z
84	"	NRT-JFK	7/30/78	1256-0008	55	O	W	Z
85	"	JFK-NRT	7/31/78	1534-0404	152	O	W	Z
86	"	NRT-SFO	8/ 1/78	0649-1514	102	O	W	Z
87	"	SFO-LAX	8/ 1/78	1839-1859	4	O	W	Z
88	"	LAX-LHR	8/ 1/78	2122-0624	125	O	W	Z
89	"	LHR-LAX	8/ 2/78	1520-0040	113	O	W	Z
90	"	LAX-AKL	8/ 3/78	0958-2123	138	O	W	Z

TABLE III - A) VL0016 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**
91	GP383	AKL-SYD	8/ 4/78	0024-0241	44	O W Z
92	"	SYD-LAX	8/ 4/78	0547-1842	156	O W Z
93	"	LAX-NRT	8/ 4/78	2203-0743	117	O W Z
94	"	NRT-JFK	8/ 5/78	1320-0040	136	O W Z
95	"	JFK-NRT	8/ 6/78	1538-0408	151	O W Z
96	"	NRT-SFO	8/ 7/78	0645-1455	98	O W Z
97	"	SFO-LAX	8/ 7/78	1911-1931	5	O
98	"	LAX-LHR	8/ 7/78	2206-0716	111	O W Z
99	"	LHR-AMS	8/ 8/78	0908-0913	2	W
100	"	AMS-LHR	8/ 8/78	1135-1140	2	
101	"	LHR-LAX	8/ 8/78	1348-2323	116	O W Z
102	"	LAX-NRT	8/ 9/78	2134-0719	118	O W Z
103	"	NRT-JFK	8/10/78	1125-2244	137	O W Z
104	"	JFK-NRT	8/11/78	1534-0404	151	O W Z
105	"	NRT-SFO	8/12/78	0657-1452	96	O W Z
106	"	SFO-LAX	8/12/78	1839-1859	5	O W Z
107	"	LAX-LHR	8/12/78	2147-0637	107	O W Z
108	"	LHR-AMS	8/13/78	0839-0849	3	O W Z
109	"	AMS-LHR	8/13/78	1115-1121	2	
110	"	LHR-LAX	8/13/78	1404-0004	119	O W Z
111	"	LAX-SFO	8/14/78	0203-0223	22	O W Z
					9010	

\+ Number of DATA records
** Constituent measurements: O - Ozone
W - Water Vapor
Z - Cabin Ozone

TABLE III - FLIGHTS ON GASP TAPE VL0016

B) FILE 2 (PANAM-N533PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
1	GP386	SFO-HKG	8/14/78	2351-1226	152	O	W	Z
2	"	HKG-BKK	8/15/78	1430-1716	49	O	W	Z
3	"	BKK-HKG	8/16/78	0039-0340	69	O	W	Z
4	"	HKG-SFO	8/16/78	0628-1743	135	O	W	Z
5	"	SFO-HKG	8/17/78	0017-1242	150	O	W	Z
6	"	HKG-SIN	8/17/78	1438-1713	32	O	W	Z
7	"	SIN-HKG	8/18/78	0107-0352	34	O	W	Z
8	"	HKG-SFO	8/18/78	0636-1751	135	O	W	Z
9	"	SFO-HKG	8/19/78	0010-1235	146	O	W	Z
10	"	HKG-SIN	8/19/78	1431-1710	51	O		Z
11	"	SIN-HKG	8/20/78	0046-0337	47	O		Z
12	"	HKG-SFO	8/20/78	0731-1929	138	O	W	Z
13	"	SFO-HKG	8/21/78	0018-1253	175	O	W	Z
14	"	HKG-SIN	8/21/78	1440-1723	63	O	W	Z
15	"	SIN-HKG	8/22/78	0045-0335	33	O	W	Z
16	"	HKG-LAX	8/22/78	0549-1759	144	O	W	Z
17	"	LAX-NRT	8/22/78	2114-0724	119	O	W	Z
18	"	NRT-JFK	8/23/78	1133-2243	130	O	W	Z
19	"	JFK-LAX	8/24/78	0155-0625	51	O	W	Z
20	"	LAX-AKL	8/24/78	0927-2105	163	O	W	Z
21	"	AKL-SYD	8/24/78	2322-0142	26	O	W	Z
22	"	SYD-LAX	8/25/78	0554-1816	161	O	W	Z
23	"	LAX-NRT	8/25/78	2217-0817	112	O	W	Z
24	"	NRT-JFK	8/26/78	1035-2153	127	O	W	Z
25	"	JFK-BAH	8/27/78	2312-1017	126	O	W	Z
26	"	BAH-BOM	8/28/78	1158-1431	28	O	W	Z
27	"	BOM-BAH	8/28/78	1651-1910	43	O	W	Z
28	"	BAH-JFK	8/28/78	2221-1041	143	O	W	Z
29	"	JFK-NRT	8/29/78	1723-0613	151	O	W	Z
30	"	NRT-SFO	8/30/78	0829-1619	92	O	W	Z
31	"	LAX-NRT	8/30/78	2148-0806	152	O	W	Z
32	"	NRT-JFK	8/31/78	1045-2154	142	O	W	Z
33	"	JFK-NRT	9/ 1/78	1620-0453	150	O	W	Z
34	"	NRT-SFO	9/ 2/78	0757-1542	91	O	W	Z
35	"	SFO-LAX	9/ 2/78	1835-1905	7	O	W	Z
36	"	LAX-LHR	9/ 2/78	2051-0551	103	O	W	Z
37	"	LHR-AMS	9/ 3/78	0800-0810	3	O		Z
38	"	AMS-LHR	9/ 3/78	1057-1107	3	O		Z
39	"	LHR-LAX	9/ 3/78	1401-2356	116	O	W	Z
40	"	LAX-SFO	9/ 4/78	0147-0213	77	O	W	Z
41	"	SFO-LAX	9/ 4/78	1804-1829	6	O	W	Z
42	"	LAX-LHR	9/ 4/78	2039-0528	171	O	W	Z
43	"	LHR-AMS	9/ 5/78	0744-0751	3			
44	"	AMS-LHR	9/ 5/78	1051-1101	3	O		Z
45	"	LHR-LAX	9/ 5/78	1401-2350	218	O	W	Z

TABLE III - B) VL0016 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	GP386	LAX-NRT	9/ 6/78	2126-0719	116	O	W	Z
47	"	NRT-JFK	9/ 7/78	1141-2224	129	O	W	Z
48	"	JFK-NRT	9/ 8/78	1529-0405	144	O	W	Z
49	"	NRT-SFO	9/ 9/78	0633-1410	111	O	W	Z
50	"	SFO-LAX	9/ 9/78	1800-1825	6	O	W	Z
51	"	LAX-LHR	9/ 9/78	2035-0527	120	O	W	Z
52	"	LHR-AMS	9/10/78	0738-0753	4	O		Z
53	"	AMS-LHR	9/10/78	1052-1103	3	O		Z
54	"	LHR-LAX	9/10/78	1341-2336	113	O	W	Z
55	"	LAX-SFO	9/11/78	0145-0210	5	O	W	Z
56	GP393	SFO-HKG	9/11/78	2342-1257	243	O	W	Z
57	"	HKG-BKK	9/12/78	1504-1759	35	O	W	Z
58	"	BKK-HKG	9/13/78	0025-0335	37	O	W	Z
59	"	HKG-SFO	9/13/78	0941-2036	68	O	W	Z
60	"	SFO-HKG	9/13/78	2353-1253	152	O	W	Z
61	"	HKG-SIN	9/14/78	1455-1735	31	O	W	Z
62	"	SIN-HKG	9/15/78	0038-0327	45	O	W	Z
63	"	HKG-SFO	9/15/78	0613-1733	132	O	W	Z
64	"	SFO-HKG	9/15/78	2351-1301	149	O	W	Z
65	"	HKG-SIN	9/16/78	1440-1719	49	O	W	Z
66	"	SIN-HKG	9/17/78	0043-0333	34	O	W	Z
67	"	HKG-SFO	9/17/78	0720-1833	183	O	W	Z
68	"	SFO-HKG	9/17/78	2331-1248	168	O	W	Z
69	"	HKG-SIN	9/18/78	1444-1728	70	O	W	Z
70	"	SIN-HKG	9/19/78	0040-0335	35	O	W	Z
71	"	HKG-LAX	9/19/78	0648-1841	154	O	W	Z
72	"	LAX-NRT	9/19/78	2122-0737	117	O	W	Z
73	"	NRT-JFK	9/20/78	1016-2132	144	O	W	Z
74	"	JFK-LAX	9/21/78	0103-0538	55	O	W	Z
75	"	LAX-NRT	9/21/78	2104-0724	122	O	W	Z
76	"	NRT-JFK	9/22/78	1028-2203	135	O	W	Z
77	"	JFK-EZE	9/23/78	0343-1023	78	O	W	Z
78	"	EZE-JFK	9/24/78	0316-1224	126	O	W	Z
79	"	JFK-NRT	9/24/78	1544-0441	151	O	W	Z
80	"	NRT-SFO	9/25/78	0636-1433	93	O	W	Z
81	"	SFO-LAX	9/25/78	1804-1827	21	O	W	Z
82	"	LAX-NRT	9/25/78	2058-0708	162	O	W	Z
83	"	NRT-JFK	9/26/78	1018-2128	131	O	W	Z
84	"	JFK-BAH	9/27/78	0021-1119	129	O	W	Z
85	"	BAH-BOM	9/27/78	1258-1523	30	O	W	Z
86	"	BOM-BAH	9/27/78	1707-1932	30	O	W	Z
87	"	BAH-JFK	9/27/78	2138-1026	201	O	W	Z
88	"	JFK-NRT	9/28/78	1551-0443	149	O	W	Z
89	"	NRT-SFO	9/29/78	0655-1455	94	O	W	Z
90	"	SFO-LAX	9/29/78	1804-1829	6	O		Z

TABLE III - B) VL0016 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**
91	GP393	LAX-LHR	9/29/78	2102-0605	104	O W Z
92	"	LHR-AMS	9/30/78	0753-0808	4	O W Z
93	"	AMS-LHR	9/30/78	1124-1134	3	O Z
94	"	LHR-LAX	9/30/78	1348-0011	159	O W Z
95	"	LAX-AKL	10/ 1/78	0635-1824	137	O W Z
96	"	AKL-SYD	10/ 1/78	2033-2245	25	O W Z
97	"	SYD-AKL	10/ 2/78	0258-0508	27	O W Z
98	"	AKL-LAX	10/ 2/78	0714-1822	133	O W Z
99	"	LAX-NRT	10/ 2/78	2140-0810	165	O W Z
100	"	NRT-JFK	10/ 3/78	1016-2136	134	O W Z
101	"	JFK-NRT	10/ 4/78	1547-0502	153	O W Z
102	"	NRT-SFO	10/ 5/78	0700-1505	110	O W Z
					9734	

\+ Number of DATA records
** Constituent measurements: O - Ozone
W - Water vapor
Z - Cabin ozone

TABLE IV - FLIGHTS ON GASP TAPE VL0017

A) FILE 1 (UAL-N4711U)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
1	GP324	SFO-ORD	1/ 5/78	1848-2138	33					
2	"	ORD-JFK	1/ 5/78	2341-0006	3					
3	"	SFO-HNL	1/ 6/78	2236-0318	55	O		C	Z	F
4	"	HNL-LAS	1/ 7/78	0548-0945	139	O			Z	
5	"	LAS-ORD	1/ 7/78	1117-1332	28				Z	
6	"	ORD-YYZ	1/ 7/78	1540-1600	5	O			Z	
7	"	YYZ-ORD	1/ 7/78	1938-2018	9	O			Z	
8	"	ORD-HNL	1/ 7/78	2247-0439	69				Z	
9	"	SFO-LAX	1/ 9/78	1758-1819	5	O	W		Z	F
10	"	LAX-JFK	1/ 9/78	2024-0019	47		W		Z	
11	"	JFK-LAX	1/10/78	0258-0728	54		W		Z	
12	"	LAX-ORD	1/10/78	1556-1841	32	O	W		Z	
13	"	ORD-SFO	1/10/78	2234-0155	69		W		Z	
14	"	SFO-HNL	1/11/78	0356-0816	53	O	W		Z	
15	"	HNL-SFO	1/11/78	1938-2333	47	O	W		Z	
16	GP327	HNL-SFO	1/13/78	2000-2354	63	O	W		Z	
17	"	SFO-ORD	1/14/78	1840-2231	44	O	W		Z	
18	"	ORD-JFK	1/15/78	0157-0252	11		W		Z	F
19	"	JFK-SFO	1/15/78	1533-2021	54		W		Z	
20	"	SFO-HNL	1/15/78	2246-0356	61	O	W		Z	
21	"	HNL-ORD	1/16/78	0547-1152	70	O	W		Z	
22	"	ORD-YYZ	1/16/78	1409-1434	6	O	W		Z	
23	"	YYZ-ORD	1/16/78	1657-1737	9	O	W		Z	
24	"	ORD-HNL	1/16/78	2001-0453	153	O	W		Z	
25	"	HNL-LAX	1/17/78	1223-1605	59	O	W		Z	
26	"	LAX-HNL	1/17/78	1820-2328	62	O	W		Z	
27	"	HNL-LAX	1/18/78	0116-0458	43	O	W		Z	F
28	"	LAX-JFK	1/18/78	2034-0019	3202	O	W		Z	
29	"	JFK-LAX	1/19/78	0233-0734	108	O	W		Z	
30	"	LAX-JFK	1/19/78	1729-2119	47	O	W		Z	
31	"	JFK-LAX	1/19/78	2328-0403	55	O	W		Z	
32	"	LAX-ORD	1/21/78	1608-1851	33		W		Z	F
33	"	ORD-HNL	1/21/78	2205-0535	89		W		Z	
34	"	HNL-ORD	1/22/78	0845-1555	82	O	W		Z	
35	"	ORD-HNL	1/22/78	1804-0154	144		W		Z	
36	"	HNL-LAX	1/23/78	1119-1534	52	O	W		Z	
37	"	LAX-HNL	1/23/78	1804-2234	53	O	W		Z	
38	"	HNL-SFO	1/24/78	0217-0620	44	O	W		Z	F
39	GP342	SFO-ORD	1/24/78	1838-2148	39	O	W		Z	
40	"	ORD-JFK	1/24/78	2347-0037	11	O	W		Z	
41	"	JFK-SFO	1/25/78	1549-2029	56	O	W		Z	
42	"	SFO-HNL	1/25/78	2240-0302	49	O	W		Z	
43	"	HNL-SFO	1/26/78	1056-1446	45	O	W		Z	
44	"	SFO-HNL	1/26/78	1733-2133	49	O	W		Z	
45	"	HNL-LAX	1/27/78	0057-0504	109	O	W		Z	

TABLE IV - A) VL0017 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	GP342	LAX-JFK	1/27/78	2138-0131	47	O	W	Z
47	"	JFK-ORD	1/28/78	0350-0500	13	O	W	Z
48	"	ORD-LAX	1/28/78	1507-1827	39	O	W	Z
49	"	LAX-ITO	1/28/78	2016-0039	68	O	W	Z
50	"	ITO-LAX	1/29/78	0237-0627	63		W	Z
51	"	LAX-ORD	1/29/78	0842-1122	32	O	W	Z
52	"	ORD-JFK	1/29/78	1423-1524	48	O	W	Z
53	"	JFK-LAX	1/29/78	1735-2215	54	O	W	Z
54	"	LAX-HNL	1/30/78	0026-0516	58	O	W	Z
55	"	HNL-SFO	1/30/78	2001-2346	46	O	W	Z
56	"	SFO-HNL	1/31/78	0348-0808	50		W	Z
57	"	HNL-LAX	1/31/78	1122-1517	47	O	W	Z
58	"	LAX-JFK	1/31/78	1722-2102	43	O	W	Z
59	"	JFK-LAX	1/31/78	2314-0409	55	O	W	Z
60	"	LAX-ITO	2/ 1/78	2004-0049	56	O	W	Z
61	"	ITO-LAX	2/ 2/78	0232-0612	44	O	W	Z
62	"	LAX-ORD	2/ 2/78	1609-1854	32	O	W	Z
63	"	ORD-SFO	2/ 2/78	2311-0245	42	O	W	Z
64	"	SFO-HNL	2/ 3/78	0431-0901	55	O	W	Z
65	"	HNL-SFO	2/ 3/78	1133-1518	43	O	W	Z
66	"	SFO-HNL	2/ 3/78	1730-2153	69	O	W	Z
67	"	HNL-LAX	2/ 4/78	0026-0422	85	O	W	Z
68	"	LAX-JFK	2/ 4/78	0612-1029	47		W	Z
69	"	JFK-ORD	2/ 4/78	1649-1804	16		W	Z
70	"	ORD-LAX	2/ 4/78	2042-2347	36	O	W	Z
71	"	LAX-JFK	2/ 5/78	1954-2349	61	O	W	Z
72	"	JFK-LAX	2/ 6/78	0214-0656	71	O	W	Z
73	"	LAX-HNL	2/ 6/78	1623-2114	73	O	W	Z
74	"	HNL-LAX	2/ 7/78	0108-0453	43	O	W	Z
75	"	LAX-HNL	2/ 7/78	2356-0506	61	O	W	Z
76	"	HNL-LAX	2/ 8/78	1050-1423	42	O	W	Z
77	"	LAX-JFK	2/ 8/78	2011-0001	46	O	W	Z
78	"	JFK-LAX	2/ 9/78	0329-0813	71	O	W	Z
79	"	LAX-ORD	2/ 9/78	1556-1826	29	O	W	Z
80	"	ORD-SFO	2/ 9/78	2213-0143	43	O	W	Z
81	GP334	HNL-LAX	2/13/78	0020-0405	43	O	W	Z
82	"	LAX-JFK	2/13/78	0627-1020	62	O	W	Z
83	"	JFK-ORD	2/13/78	1618-1837	42	O	W	Z
84	"	ORD-HNL	2/14/78	1707-0107	90		W	Z
85	"	HNL-LAX	2/15/78	1110-1514	46	O	W	Z
86	"	LAX-HNL	2/15/78	1811-2256	56	O	W	Z
87	"	HNL-SFO	2/16/78	0050-0445	46	O	W	Z
88	"	SFO-ORD	2/16/78	1834-2124	34	O	W	Z
89	"	ORD-JFK	2/16/78	2339-0029	11	O	W	Z
90	"	JFK-SFO	2/17/78	1539-2029	54	O	W	Z F

TABLE IV - A) VL0017 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
91	GP378	SFO-HNL	2/17/78	2243-0258	48		W		Z
92	"	HNL-ORD	2/18/78	0509-1216	103		W		Z
93	"	ORD-YYZ	2/18/78	1438-1508	7		W		Z
94	"	YYZ-ORD	2/18/78	1703-1738	8		W		Z
95	"	ORD-HNL	2/18/78	1953-0332	196		W		Z
96	"	HNL-LAX	2/19/78	1112-1521	217		W		Z
97	"	LAX-HNL	2/19/78	1828-2310	129		W		Z
98	"	HNL-SFO	2/20/78	0054-0444	74		W		Z
99	"	SFO-ORD	2/20/78	1837-2147	38		W		Z
100	"	ORD-JFK	2/20/78	2344-0040	451		W		Z
101	"	SFO-HNL	2/21/78	2236-0306	52	O	W	C	Z
102	"	HNL-ORD	2/22/78	0535-1232	99	O	W	C	Z
103	"	ORD-DEN	2/22/78	1453-1623	19	O	W	C	Z
104	"	DEN-LAX	2/22/78	1811-1931	16	O	W		Z
105	"	LAX-HNL	2/22/78	2134-0222	73		W		Z
106	"	HNL-LAX	2/23/78	1931-2333	63	O	W	C	Z
107	"	LAX-JFK	2/25/78	0654-1044	45	O	W		Z
108	"	JFK-ORD	2/25/78	1620-1745	17	O	W	C	Z
109	"	ORD-LAX	2/25/78	1945-2320	44		W		Z
110	"	LAX-JFK	2/26/78	2034-0014	44	O	W	C	Z
111	"	JFK-LAX	2/27/78	0228-0731	517		W		Z
112	"	LAX-ORD	2/27/78	1612-1842	30	O	W	C	Z
113	"	ORD-SFO	2/27/78	2215-0149	44		W		Z
114	"	SFO-HNL	2/28/78	0354-0824	54		W		Z
115	"	HNL-SFO	2/28/78	1054-1435	41	O	W	C	Z
116	GP345	SFO-HNL	2/28/78	1734-2209	55	O	W	C	Z
117	"	HNL-LAX	3/ 1/78	0027-0414	550		W		Z
118	"	LAX-SFO	3/ 1/78	1648-1717	39	O	W		
119	"	SFO-ORD	3/ 1/78	1851-2136	33	O	W	C	Z
120	"	ORD-JFK	3/ 1/78	2355-0045	11		W		Z
121	"	JFK-SFO	3/ 2/78	1535-2054	65		W		Z
122	"	SFO-HNL	3/ 2/78	2304-0409	56		W		Z
123	"	HNL-ORD	3/ 3/78	0636-1237	84		W		Z
124	"	ORD-SFO	3/ 6/78	2216-0136	38	O	W	C	Z
125	"	SFO-HNL	3/ 7/78	0351-0846	57	O	W	C	Z F
126	"	HNL-LAX	3/ 7/78	1928-2333	49	O	W	C	Z
127	"	LAX-DEN	3/ 8/78	0142-0308	17	O	W		Z
128	"	DEN-ORD	3/ 8/78	0437-0600	44	O	W	C	Z
129	"	ORD-DEN	3/ 8/78	1453-1618	17	O	W	C	Z
130	"	DEN-LAX	3/ 8/78	1808-1934	33	O	W	C	Z
131	"	LAX-HNL	3/ 8/78	2152-0232	57	O	W	C	Z
132	"	HNL-SFO	3/ 9/78	2002-2352	47	O	W	C	Z
133	"	SFO-HNL	3/10/78	0157-0612	51		W		Z F
134	"	HNL-SFO	3/10/78	1056-1454	488	O	W	C	Z
135	"	SFO-HNL	3/10/78	1815-2218	105	O	W	C	Z

TABLE IV - A) VL0017 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
136	GP345	HNL-LAX	3/11/78	0043-0503	49		W		Z	
137	"	LAX-HNL	3/11/78	1825-2243	66		W		Z	
138	"	HNL-SFO	3/12/78	0053-0500	79		W		Z	F
139	"	SFO-JFK	3/12/78	2028-0048	491	O	W	C	Z	
140	"	JFK-ORD	3/13/78	0323-0453	19	O	W		Z	
141	"	DEN-LAX	3/13/78	1752-1912	17	O	W	C	Z	
142	"	LAX-HNL	3/13/78	2140-0210	51	O	W	C	Z	
143	"	HNL-ORD	3/14/78	0438-1119	97	O	W	C	Z	
144	"	ORD-YYZ	3/14/78	1407-1437	7	O	W	C	Z	
145	"	YYZ-ORD	3/14/78	1657-1733	8	O	W	C	Z	
146	"	ORD-HNL	3/14/78	2000-0355	89		W		Z	
147	"	HNL-ORD	3/15/78	0600-1250	80		W		Z	
148	"	ORD-LAX	3/15/78	1508-1818	38	O	W	C	Z	
149	"	LAX-ITO	3/15/78	2014-0044	54	O	W	C	Z	
150	"	ITO-LAX	3/16/78	0231-0624	45		W		Z	F
151	"	LAX-ORD	3/16/78	0840-1128	50		W		Z	
152	"	ORD-JFK	3/16/78	1338-1437	28		W		Z	
153	"	JFK-LAX	3/16/78	1742-2230	512	O	W	C	Z	
154	"	LAX-HNL	3/17/78	0040-0536	56	O	W	C	Z	
155	"	ORD-HNL	3/18/78	1714-0059	94	O	W	C	Z	
156	"	HNL-ORD	3/19/78	0446-1129	210		W		Z	
157	"	ORD-YYZ	3/19/78	1401-1421	5				Z	
158	"	YYZ-ORD	3/19/78	1651-1731	9		W		Z	
159	"	ORD-HNL	3/19/78	1945-0332	533		W		Z	F
160	"	HNL-LAX	3/20/78	1110-1503	48	O	W	C	Z	
					14822					

\+ Number of DATA records
** Constituent measurements: O - Ozone
W - Water Vapor
F - Filter Exposure
C - Carbon Monoxide
Z - Cabin Ozone

TABLE IV - FLIGHTS ON GASP TAPE VL0017

B) FILE 2 (UAL-N4711U)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
1	GP348	SFO-HNL	3/22/78	0403-0615	100	O	W	C		Z
2	"	HNL-LAX	3/22/78	1254-1254	1		W			
3	"	LAX-JFK	3/24/78	1716-2118	122	O	W	C		Z
4	"	JFK-LAX	3/24/78	2309-0349	55		W			Z
5	"	ORD-YYZ	3/26/78	1418-1448	7	O	W			Z
6	"	YYZ-ORD	3/26/78	1700-1735	8		W			Z
7	"	ORD-HNL	3/26/78	2018-0408	90		W			Z
8	"	HNL-ORD	3/27/78	0638-1330	53		W			Z
9	"	ORD-HNL	3/27/78	1707-0055	92		W			Z
10	"	HNL-LAX	3/28/78	1934-2332	6	O	W			Z
11	"	LAX-DEN	3/29/78	0142-0302	459		W			Z
12	"	DEN-ORD	3/29/78	0436-0555	14		W			Z
13	"	ORD-HNL	3/29/78	1718-0058	90	O	W	C		Z
14	"	HNL-LAX	3/30/78	1113-1518	49	O	W	C		Z
15	"	LAX-HNL	3/30/78	1845-2320	52	O	W	C		Z
16	"	HNL-SFO	3/31/78	0126-0523	16	O	W	C		Z
17	GP354	SFO-ORD	3/31/78	1850-2147	52	O	W	C		Z
18	"	ORD-JFK	4/ 1/78	0207-0302	11	O	W			Z
19	"	SFO-HNL	4/ 1/78	2245-0255	48	O	W	C		Z
20	"	HNL-ORD	4/ 2/78	0529-1229	84	O	W	C		Z
21	"	ORD-DEN	4/ 2/78	1448-1628	20	O	W	C		Z
22	"	DEN-LAX	4/ 2/78	1807-1941	48	O	W	C		Z
23	"	LAX-HNL	4/ 2/78	2149-0229	56	O	W	C		Z
24	"	HNL-SFO	4/ 3/78	1955-0000	50	O	W	C		Z
25	"	SFO-HNL	4/ 5/78	2248-0258	48	O	W	C		Z
26	"	HNL-ORD	4/ 6/78	0518-1216	523	O	W	C		Z
27	"	ORD-DEN	4/ 6/78	1512-1714	19	O	W	C		Z
28	"	DEN-LAX	4/ 6/78	1910-2050	21	O	W	C		Z
29	"	LAX-HNL	4/ 6/78	2241-0315	129	O	W	C		Z
30	"	HNL-ORD	4/ 7/78	0527-1228	100	O	W	C		Z
31	"	ORD-DEN	4/ 7/78	1449-1635	22	O	W	C		Z
32	"	SFO-ORD	4/10/78	1843-2138	36	O	W	C		Z
33	"	ORD-JFK	4/10/78	2350-0040	11	O	W	C		Z
34	"	SFO-HNL	4/11/78	2253-0313	51	O	W	C		Z
35	"	HNL-ORD	4/12/78	0528-1212	79	O	W	C		Z
36	"	JFK-LAX	4/13/78	1740-2237	59	O	W	C		Z
37	"	LAX-HNL	4/14/78	0041-0536	57		W			Z
38	"	HNL-SFO	4/14/78	2001-2351	47	O	W	C		Z
39	"	SFO-JFK	4/15/78	0636-1036	47	O	W	C		Z
40	"	JFK-ORD	4/15/78	1637-1757	459	O	W	C		Z
41	"	ORD-LAX	4/15/78	1949-2322	60	O	W	C		Z
42	"	LAX-DEN	4/16/78	0219-0334	16	O	W	C		Z
43	"	DEN-ORD	4/16/78	0500-0615	15	O	W	C		Z
44	"	ORD-DEN	4/16/78	1439-1614	20	O	W	C		Z
45	"	DEN-LAX	4/16/78	1750-1927	35	O	W	C		Z

TABLE IV - B) VL0017 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
46	GP354	LAX-HNL	4/16/78	2132-0232	58	O	W	C		Z	
47	"	HNL-ORD	4/17/78	0525-1153	106		W		A	Z	
48	"	ORD-LAX	4/17/78	1458-1813	91		W		A	Z	
49	"	LAX-ITO	4/17/78	2007-0042	54		W		A	Z	
50	"	ITO-LAX	4/18/78	0231-0608	485		W		A	Z	
51	"	LAX-ORD	4/18/78	0856-1131	32		W		A	Z	
52	"	ORD-JFK	4/18/78	1400-1501	28		W			Z	
53	"	JFK-LAX	4/18/78	1726-2201	69	O	W	C	A	Z	F
54	"	LAX-HNL	4/19/78	0039-0529	55	O	W	C	A	Z	
55	"	HNL-SFO	4/19/78	1958-2338	41	O	W	C	A	Z	
56	GP356	SFO-HNL	4/21/78	2240-0317	53	O	W	C		Z	F
57	"	HNL-SFO	4/22/78	2007-2347	41	O	W	C		Z	
58	"	SFO-JFK	4/23/78	2032-0036	48	O	W	C		Z	F
59	"	JFK-LAX	4/24/78	0240-0717	70	O	W	C		Z	
60	"	LAX-ORD	4/24/78	1607-1852	33	O	W	C		Z	
61	"	ORD-SFO	4/24/78	2218-0144	43	O	W	C		Z	
62	"	SFO-HNL	4/25/78	0437-0857	50	O	W	C		Z	
63	"	HNL-SFO	4/25/78	2007-2353	45	O	W	C		Z	F
64	"	SFO-ORD	4/26/78	1828-2118	33	O	W	C		Z	
65	"	ORD-JFK	4/26/78	2346-0044	27		W			Z	
66	"	JFK-SFO	4/27/78	1623-2111	87	O	W	C		Z	
67	GP357	SFO-HNL	4/27/78	2238-0244	48	O	W	C		Z	F
68	"	HNL-LAX	4/28/78	1736-2216	54	O	W	C		Z	
69	"	LAX-DEN	4/29/78	0016-0136	31		W			Z	F
70	"	DEN-ORD	4/29/78	0258-0415	459		W			Z	
71	"	ORD-DEN	4/29/78	1244-1419	20	O	W	C		Z	
72	"	DEN-LAX	4/29/78	1550-1720	19	O	W	C		Z	
73	"	LAX-HNL	4/29/78	1937-0002	68		W			Z	
74	"	HNL-LAX	4/30/78	0826-1241	51	O	W	C		Z	
75	"	LAX-HNL	4/30/78	1502-1926	53		W			Z	
76	"	HNL-SFO	4/30/78	2154-0204	50		W			Z	
77	"	SFO-ORD	5/ 7/78	1738-2028	34	O	W	C		Z	
78	"	ORD-JFK	5/ 7/78	2251-2336	10	O	W			Z	
79	"	JFK-SFO	5/ 8/78	1505-1915	49	O	W	C		Z	
					5932						

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- F - Filter Exposure
- C - Carbon Monoxide
- A - Condensation Nuclei
- Z - Cabin Ozone

TABLE IV - FLIGHTS ON GASP TAPE VL0017

C) FILE 3 (UAL-N4711U)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
1	GP361	SFO-HNL	5/ 8/78	2136-0136	44	O	W	C		Z	
2	"	HNL-ORD	5/ 9/78	0424-1134	84	O	W	C		Z	
3	"	ORD-DEN	5/ 9/78	1407-1537	19		W			Z	
4	"	DEN-LAX	5/ 9/78	1656-1821	18	O	W	C		Z	
5	"	LAX-HNL	5/ 9/78	2032-0052	51		W		A	Z	
6	"	HNL-ORD	5/10/78	0345-1035	80	O	W	C	A	Z	
7	"	ORD-YYZ	5/10/78	1319-1339	5	O	W		A	Z	
8	"	YYZ-ORD	5/10/78	1606-1638	35		W		A	Z	
9	"	ORD-HNL	5/10/78	1904-0244	88		W		A	Z	
10	"	HNL-LAX	5/11/78	1016-1426	49	O	W	C	A	Z	
11	"	LAX-HNL	5/11/78	1723-2148	54	O	W	C	A	Z	
12	"	HNL-LAX	5/12/78	0004-0404	49	O	W	C	A	Z	
13	"	JFK-ORD	5/13/78	1523-1623	13	O	W		A	Z	
14	"	ORD-LAX	5/13/78	1851-2154	35	O	W	C		Z	
15	"	LAX-HNL	5/14/78	1707-2137	53		W			Z	
16	"	HNL-SFO	5/15/78	0004-0349	45		W			Z	
17	"	SFO-ORD	5/15/78	1737-2032	34	O	W	C		Z	
18	"	ORD-JFK	5/15/78	2246-2354	15		W			Z	
19	"	JFK-SFO	5/16/78	1431-1852	69	O	W	C		Z	
20	"	SFO-HNL	5/16/78	2204-0224	52	O	W	C		Z	
21	"	HNL-ORD	5/17/78	0422-1115	82		W		A	Z	
22	"	ORD-LAX	5/17/78	1340-1643	59		W		A	Z	
23	"	LAX-ITO	5/17/78	1900-2330	52	O	W	C	A	Z	
24	"	ITO-LAX	5/18/78	0133-0526	46	O	W	C	A	Z	F
25	"	LAX-ORD	5/18/78	0738-1021	48	O	W	C	A	Z	
26	"	ORD-JFK	5/18/78	1227-1330	29	O	W		A	Z	
27	"	JFK-LAX	5/18/78	1640-2110	54	O	W	C	A	Z	
28	"	LAX-HNL	5/18/78	2332-0412	55	O	W	C	A	Z	
29	"	HNL-SFO	5/19/78	1959-2349	45	O	W	C	A	Z	
30	GP368	SFO-JFK	5/20/78	1928-2323	47	O	W	C		Z	
31	"	JFK-ORD	5/21/78	0236-0350	14	O	W	C		Z	
32	"	ORD-HNL	5/21/78	1635-0027	122	O	W	C		Z	
33	"	LAX-HNL	5/22/78	2046-0131	55	O	W	C	A	Z	
34	"	HNL-SFO	5/23/78	2021-0001	45	O	W	C	A	Z	
35	"	SFO-ORD	5/24/78	1744-2033	34	O	W	C			F
36	"	ORD-JFK	5/24/78	2259-2352	28		W				
37	"	JFK-SFO	5/25/78	1440-1917	82	O	W	C			
38	GP375	SFO-HNL	5/25/78	2141-0136	41	O	W	C		Z	
39	"	HNL-SFO	5/26/78	2002-2357	47	O	W	C		Z	
40	"	SFO-JFK	5/27/78	1934-2348	70	O	W	C		Z	F
41	"	JFK-ORD	5/28/78	0232-0332	13	O	W			Z	
42	"	ORD-HNL	5/28/78	1607-2327	85	O	W	C		Z	
43	"	HNL-ORD	5/29/78	0340-1035	79	O	W	C		Z	
44	"	ORD-YYZ	5/29/78	1305-1330	6	O	W				
45	"	YYZ-ORD	5/29/78	1555-1620	6	O	W	C		Z	

TABLE IV - C) VL0017 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**						
46	GP375	ORD-HNL	5/29/78	1857-0232	90	O	W	C			Z	
47	"	HNL-SFO	5/30/78	0952-1344	43	O	W	C			Z	F
48	"	SFO-HNL	5/30/78	1637-2042	49	O	W	C			Z	
49	"	HNL-LAX	5/31/78	0004-0358	45	O	W	C			Z	
50	"	LAX-JFK	5/31/78	1912-2344	84	O	W	C			Z	
51	"	JFK-LAX	6/ 1/78	0405-0842	71	O	W	C			Z	
52	"	LAX-ORD	6/ 1/78	1511-1750	30	O	W	C			Z	
53	"	ORD-SFO	6/ 1/78	2137-0100	58	O	W	C		A	Z	
54	"	SFO-HNL	6/ 2/78	0311-0726	51	O	W	C		A	Z	
55	"	HNL-SFO	6/ 2/78	0939-1319	43	O	W	C		A	Z	
56	"	SFO-HNL	6/ 2/78	1635-2050	50	O	W	C		A	Z	
57	"	HNL-LAX	6/ 2/78	2301-0256	47	O	W	C		A	Z	
58	"	LAX-JFK	6/ 3/78	0542-0917	41	O	W	C		A	Z	
59	"	JFK-ORD	6/ 3/78	1522-1632	15	O	W	C		A	Z	
60	"	ORD-LAX	6/ 3/78	1851-2157	55	O	W	C		A	Z	
61	"	LAX-HNL	6/ 4/78	1719-2144	52	O	W	C		A	Z	
62	"	HNL-SFO	6/ 5/78	0000-0345	45	O	W	C		A	Z	
63	"	SFO-ORD	6/ 5/78	1738-2038	37	O	W	C			Z	
64	"	ORD-JFK	6/ 5/78	2258-2348	11	O	W				Z	
65	"	JFK-SFO	6/ 6/78	1430-1910	57	O	W	C		A	Z	
66	GP372	SFO-HNL	6/ 6/78	2143-0153	51	O	W	C		A	Z	
67	"	HNL-ORD	6/ 7/78	0430-1115	82	O	W	C		A	Z	
68	"	ORD-LAX	6/ 7/78	1357-1654	62	O	W	C		A	Z	
69	"	LAX-ITO	6/ 7/78	1957-0007	51	O	W	C		A	Z	
70	"	ITO-LAX	6/ 8/78	0211-0601	46	O	W	C		A	Z	F
71	"	LAX-ORD	6/ 8/78	0810-1055	34	O	W	C		A	Z	
72	"	ORD-JFK	6/ 8/78	1245-1340	12	O	W			A	Z	
73	"	JFK-LAX	6/ 8/78	1638-2112	71	O	W	C		A	Z	
74	"	LAX-HNL	6/ 8/78	2335-0404	55	O	W	C		A	Z	
75	"	HNL-LAX	6/ 9/78	1032-1424	63	O	W	C		A	Z	
76	"	LAX-JFK	6/10/78	1932-2343	67	O	W	C		A	Z	
77	"	JFK-LAX	6/11/78	0213-0624	62	O	W	C		A	Z	F
78	"	LAX-HNL	6/11/78	1546-2001	51	O	W	C		A	Z	
79	"	HNL-SFO	6/11/78	2241-0231	47	O	W	C		A	Z	
80	"	SFO-ORD	6/12/78	2049-2329	33	O	W	C		A	Z	
81	"	ORD-JFK	6/13/78	0200-0250	11	O	W			A	Z	
82	"	JFK-ORD	6/13/78	1241-1344	29	O	W			A	Z	
83	"	ORD-SFO	6/13/78	1622-1942	41	O	W	C		A	Z	
84	"	SFO-JFK	6/13/78	2135-0122	46	O	W	C		A	Z	
85	"	JFK-SFO	6/14/78	1413-1917	75	O	W	C		A	Z	F
86	"	SFO-HNL	6/14/78	2132-0147	52	O	W	C	P	A	Z	
87	"	HNL-ORD	6/15/78	0412-1101	153	O	W	C	P	A	Z	
88	"	ORD-DEN	6/15/78	1423-1603	68	O	W	C	P	A	Z	
89	"	DEN-LAX	6/15/78	1802-1927	18	O	W	C	P	A	Z	
90	"	LAX-HNL	6/15/78	2157-0247	59	O	W	C	P	A	Z	

TABLE IV - C) VL0017 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**						
91	GP372	HNL-SFO	6/16/78	2004-2344	44	O	W	C	P	A	Z	
92	"	SFO-HNL	6/17/78	0306-0707	49	O	W	C	P	A	Z	F
93	"	HNL-SFO	6/17/78	0949-1329	45	O	W	C	P	A	Z	
94	"	SFO-JFK	6/17/78	1632-2022	46	O	W	C	P	A	Z	
95	"	JFK-LAX	6/17/78	2252-0327	55	O	W	C	P	A	Z	
96	"	LAX-ORD	6/18/78	0817-1047	31	O	W	C	P	A	Z	
97	"	ORD-HNL	6/18/78	1633-0004	104	O	W	C	P	A	Z	
98	"	HNL-SFO	6/19/78	0213-0552	45	O	W	C	P	A	Z	
99	"	JFK-ORD	6/20/78	1529-1636	13	O	W		P	A	Z	F
100	"	ORD-HNL	6/20/78	1915-0300	93	O	W	C	P	A	Z	
101	"	ITO-ORD	6/21/78	0818-1436	92	O	W	C	P	A	Z	
102	"	ORD-DTW	6/21/78	1743-1748	2		W		P			
103	"	DTW-ORD	6/21/78	1936-1941	2		W		P			
104	"	ORD-LAX	6/21/78	2159-0059	37	O	W	C	P	A	Z	
105	"	LAX-HNL	6/22/78	0307-0747	57	O	W	C	P	A	Z	
106	"	HNL-LAX	6/22/78	1038-1423	46	O	W	C	P	A	Z	
107	"	LAX-HNL	6/22/78	1747-2237	59	O	W	C	P	A	Z	
108	"	ITO-LAX	6/23/78	0201-0541	45	O	W	C	P	A	Z	
					5314							

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- F - Filter Exposure
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei
- Z - Cabin Ozone

TABLE V - FLIGHTS ON GASP TAPE VL0018

A) FILE 1 (UAL-N4711U)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
1	GP379	LAX-JFK	6/23/78	1938-2338	49	O	W		P	A	Z
2		JFK-LAX	6/24/78	0215-0653	71	O	W	C	P	A	Z
3	"	LAX-HNL	6/24/78	1548-2043	60	O	W	C	P	A	Z
4	"	HNL-SFO	6/24/78	2240-0210	43	O	W	C	P	A	Z
5	"	SFO-ORD	6/25/78	2045-0020	91	O	W	C	P	A	Z
6	"	ORD-JFK	6/26/78	0309-0354	10	O	W			A	Z
7	"	JFK-ORD	6/26/78	1227-1445	90	O	W	C	P	A	Z
8	"	ORD-SFO	6/26/78	1654-2013	56	O	W		P	A	Z
9	"	SFO-JFK	6/26/78	2158-0143	46	O	W	C	P	A	Z
10	"	JFK-SFO	6/27/78	1434-1924	59	O	W	C	P	A	Z
11	"	SFO-HNL	6/27/78	2150-0210	53	O	W	C	P	A	Z
12	"	HNL-ORD	6/28/78	0428-1103	80	O	W	C	P	A	Z
13	"	ORD-DEN	6/28/78	1406-1536	19	O	W		P	A	Z
14	"	DEN-LAX	6/28/78	1732-1852	17	O	W		P	A	Z
15	"	LAX-HNL	6/28/78	2122-0202	57	O	W	C	P	A	Z
16	"	ITO-ORD	6/29/78	0820-1456	95	O	W	C	P	A	Z
17	"	ORD-DTW	6/29/78	1718-1723	2		W		P		
18	"	DTW-ORD	6/29/78	1911-1916	2		W		P		
19	"	ORD-LAX	6/29/78	2326-0206	33	O	W		P	A	Z
20	"	LAX-HNL	6/30/78	0414-0904	59	O	W	C	P	A	Z
21	"	HNL-LAX	6/30/78	1934-2314	44	O	W		P	A	Z
22	"	LAX-DEN	7/ 1/78	0158-0308	15	O	W		P	A	Z
23	"	DEN-ORD	7/ 1/78	0502-0622	17	O	W		P	A	Z
24	"	ORD-HNL	7/ 1/78	1804-0149	94	O	W	C	P	A	Z
25	"	HNL-ORD	7/ 2/78	0417-1047	78	O	W	C	P	A	Z
26	"	ORD-JFK	7/ 2/78	1301-1355	12	O	W		P	A	Z
27	"	JFK-LAX	7/ 2/78	1630-2050	53	O	W	C	P	A	Z
28	"	LAX-HNL	7/ 2/78	2338-0423	58	O	W	C	P	A	Z
29	"	HNL-ITO	7/ 3/78	0631-0631	1		W				
30	"	ITO-ORD	7/ 3/78	0829-1454	78	O	W	C	P	A	Z
31	"	ORD-DTW	7/ 3/78	1712-1716	17		W				
32	"	DTW-ORD	7/ 3/78	1906-1911	2		W		P		
33	"	ORD-LAX	7/ 3/78	2121-0021	37	O	W		P	A	Z
34	"	LAX-HNL	7/ 4/78	0304-0744	57	O	W	C	P	A	Z
35	"	HNL-SFO	7/ 4/78	1958-2328	43	O	W		P	A	Z
36	"	SFO-HNL	7/ 5/78	0255-0725	55	O	W	C	P	A	Z
37	"	HNL-LAX	7/ 5/78	1940-2335	48	O	W		P	A	Z
38	"	LAX-DEN	7/ 6/78	0156-0302	30	O	W		P	A	Z
39	"	DEN-ORD	7/ 6/78	0449-0601	38	O	W		P	A	Z
40	"	ORD-HNL	7/ 6/78	1633-0008	91	O	W	C	P	A	Z
41	"	HNL-LAX	7/ 7/78	1935-2335	49	O	W	C	P	A	Z
42	"	LAX-DEN	7/ 8/78	0149-0300	26	O	W		P	A	Z
43	"	DEN-ORD	7/ 8/78	0454-0604	15	O	W		P	A	Z
44	"	ORD-HNL	7/ 8/78	1616-0001	93	O	W	C	P	A	Z
45	"	HNL-SFO	7/ 9/78	0218-0603	46	O	W	C	P	A	Z

TABLE V - A) VL0018 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
46	GP379	SFO-HNL	7/ 9/78	1814-2229	51	O	W	C	P	A	Z
47	"	HNL-LAX	7/10/78	0112-0512	49	O	W	C	P	A	Z
48	"	LAX-HNL	7/10/78	1554-2019	54	O	W	C	P	A	Z
49	"	HNL-SFO	7/10/78	2235-0215	45	O	W	C	P	A	Z
50	GP382	SFO-ORD	7/11/78	2044-2329	34	O	W		P	A	Z
51	"	ORD-JFK	7/12/78	0147-0237	11		W		P	A	Z
52	"	JFK-ORD	7/12/78	1211-1316	14	O	W		P	A	Z
53	"	ORD-SFO	7/12/78	1535-1850	39	O	W		P	A	Z
54	"	SFO-JFK	7/13/78	2101-0047	62	O	W		P	A	Z
55	"	JFK-SFO	7/14/78	1425-1910	77	O	W		P	A	Z
56	"	SFO-HNL	7/14/78	2107-0127	53	O	W		P	A	Z
57	"	HNL-ORD	7/15/78	0355-1025	79	O	W		P	A	Z
58	"	ORD-HNL	7/15/78	1702-0042	107	O	W		P	A	Z
59	"	HNL-SFO	7/16/78	0401-0736	44	O	W		P	A	Z
60	"	SFO-HNL	7/16/78	1633-2048	52	O	W		P	A	Z
61	"	HNL-LAX	7/17/78	0043-0438	48	O	W		P	A	Z
62	"	LAX-JFK	7/17/78	0634-1039	50	O	W		P	A	Z
63	"	JFK-ORD	7/17/78	1535-1641	31	O	W		P	A	Z
64	"	ORD-HNL	7/17/78	1920-0249	92	O	W		P	A	Z
65	"	ITO-ORD	7/18/78	0816-1458	138	O	W		P	A	Z
66	"	ORD-DTW	7/18/78	1715-1720	2		W		P		
67	"	DTW-ORD	7/18/78	1909-1914	2		W		P		
68	"	ORD-LAX	7/18/78	2126-0021	36	O	W		P	A	Z
69	"	LAX-HNL	7/19/78	0309-0729	53	O	W		P	A	Z
70	"	HNL-LAX	7/19/78	0956-1356	49	O	W		P	A	Z
71	"	LAX-HNL	7/19/78	1800-2220	53	O	W		P	A	Z
72	"	ITO-LAX	7/20/78	0249-0639	47	O	W		P	A	Z
73	"	LAX-JFK	7/20/78	1937-2337	49	O	W		P	A	Z
74	"	JFK-LAX	7/21/78	0222-0627	50	O	W		P	A	Z
75	"	LAX-HNL	7/21/78	1547-2006	54	O	W		P	A	Z
76	"	HNL-SFO	7/21/78	2240-0230	47	O	W		P	A	Z
77	"	SFO-HNL	7/22/78	1640-2045	50	O	W		P		Z
78	"	HNL-LAX	7/23/78	0020-0325	38	O	W		P		Z
79	"	LAX-JFK	7/23/78	0540-0930	47	O	W		P		Z
80	"	JFK-ORD	7/23/78	1534-1639	14	O	W			A	Z
81	"	ORD-HNL	7/23/78	1855-0235	93	O	W			A	Z
82	"	HNL-ITO	7/24/78	0627-0627	1		W				
83	"	ITO-ORD	7/24/78	0933-1613	81	O	W			A	Z
84	"	ORD-LAX	7/24/78	2158-0053	36	O	W			A	Z
85	"	LAX-HNL	7/25/78	0303-0728	54	O	W			A	Z
86	"	HNL-LAX	7/25/78	1001-1400	48	O	W			A	Z
87	"	LAX-HNL	7/25/78	1736-2206	55	O	W			A	Z
88	"	HNL-LAX	7/26/78	0002-0406	59	O	W			A	Z
89	"	LAX-HNL	7/26/78	1550-2015	54	O	W			A	Z
90	"	HNL-SFO	7/26/78	2240-0220	46	O	W			A	Z

TABLE V - A) VL0018 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
91	GP382	SFO-JFK	7/27/78	2129-0129	85	O	W		A	Z	
92	"	JFK-SFO	7/28/78	1413-1858	58	O	W		A	Z	
93	"	SFO-HNL	7/28/78	2113-0133	53	O	W		A	Z	
94	"	HNL-ORD	7/29/78	0353-1038	82	O	W		A	Z	
95	"	ORD-DEN	7/29/78	1403-1528	18	O	W		A	Z	
96	"	DEN-LAX	7/29/78	1728-1848	17	O	W		A	Z	
97	"	LAX-HNL	7/29/78	2106-0132	54	O	W		A	Z	
98	"	HNL-SFO	7/30/78	2002-2342	45	O	W		A	Z	
99	"	SFO-HNL	7/31/78	0317-0702	46	O	W		A	Z	
100	"	HNL-SFO	7/31/78	0944-1324	45	O	W		A	Z	
101	"	SFO-JFK	7/31/78	1618-2008	46	O	W		A	Z	
102	"	JFK-LAX	8/ 1/78	0001-0427	71	O	W		A	Z	
103	"	LAX-JFK	8/ 1/78	1938-2323	46	O	W		A	Z	
104	"	JFK-LAX	8/ 2/78	0222-0647	54	O	W		A	Z	
105	"	LAX-HNL	8/ 2/78	1557-2017	53	O	W		A	Z	
106	"	HNL-SFO	8/ 2/78	2233-0213	45	O	W		A	Z	
107	"	SFO-HNL	8/ 3/78	1822-2232	51	O	W			Z	
108	"	HNL-LAX	8/ 4/78	0055-0455	49	O	W		A	Z	
109	"	LAX-ORD	8/ 4/78	0830-1105	32	O	W		A	Z	
110	"	ORD-HNL	8/ 4/78	1715-0049	92	O	W		A	Z	
111	"	HNL-ORD	8/ 5/78	0309-1004	84	O	W		A	Z	
112	"	ORD-JFK	8/ 5/78	1234-1329	12	O	W		A	Z	
113	"	JFK-LAX	8/ 5/78	1631-2041	51	O	W		A	Z	
114	"	LAX-HNL	8/ 5/78	2333-0358	54	O	W		A	Z	
115	"	HNL-SFO	8/ 6/78	0943-1333	47	O	W		A	Z	
116	"	SFO-JFK	8/ 6/78	1639-2120	123	O	W		A	Z	
117	"	JFK-SFO	8/ 6/78	2353-0429	74	O	W		A	Z	
118	"	SFO-HNL	8/ 7/78	1845-2256	51	O	W		A	Z	
119	"	HNL-LAX	8/ 8/78	0207-0607	48	O	W		A	Z	
120	"	LAX-HNL	8/ 9/78	1546-2006	53	O	W		A	Z	
121	"	HNL-SFO	8/ 9/78	2236-0226	47	O	W		A	Z	
122	"	SFO-JFK	8/10/78	2111-0108	2967		W	C			F
123	"	JFK-SFO	8/11/78	1415-1850	56		W	C	A		
					9046						

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- F - Filter Exposure
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei
- Z - Cabin Ozone

TABLE V - FLIGHTS ON GASP TAPE VL0018

B) FILE 2 (UAL-N4711U)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Qata**					
1	GP385	SFO-JFK	8/11/78	2123-0113	46	O	W	C		A	Z	
2	"	JFK-ORD	8/12/78	1228-1333	14	O	W	C		A	Z	
3	"	ORD-SFO	8/12/78	1611-1911	37	O	W	C		A	Z	
4	"	SFO-JFK	8/12/78	2104-0112	66	O	W	C		A	Z	
5	"	JFK-SFO	8/13/78	1414-1840	54	O	W	C		A	Z	F
6	"	SFO-JFK	8/13/78	2102-0110	66	O	W	C		A	Z	
7	"	JFK-ORD	8/14/78	1256-1354	28	O	W			A	Z	
8	"	ORD-SFO	8/14/78	1550-1854	103	O	W	C		A	Z	
9	"	SFO-JFK	8/14/78	2108-0108	49	O	W	C		A	Z	
10	"	JFK-ORD	8/15/78	1222-1322	13		W			A		
11	"	ORD-SFO	8/15/78	1546-1912	68	O	W	C		A	Z	
12	"	SFO-ORD	8/15/78	2110-2355	34	O	W	C		A	Z	
13	"	ORD-JFK	8/16/78	0345-0436	11	O	W			A	Z	F
14	"	JFK-ORD	8/16/78	1217-1322	14	O	W			A	Z	
15	"	ORD-SFO	8/16/78	1542-1902	41	O	W	C		A	Z	
16	"	SFO-JFK	8/16/78	2201-0147	9		W			A		
17	"	JFK-ORD	8/17/78	1220-1325	14		W			A		
18	"	ORD-SFO	8/18/78	1250-1617	70	O	W	C		A	Z	
19	GP392	JFK-SFO	9/15/78	1412-1907	57		W			A	Z	
20	"	SFO-HNL	9/15/78	2106-0106	48	O	W			A	Z	
21	"	HNL-ORD	9/16/78	0356-1041	249	O	W			A	Z	
22	"	ORD-DEN	9/16/78	1349-1524	35	O	W			A	Z	
23	"	DEN-LAX	9/16/78	1717-1842	18	O	W			A	Z	
24	"	LAX-HNL	9/16/78	2101-0120	52	O	W			A	Z	
25	"	HNL-LAX	9/17/78	0944-1400	52	O	W			A	Z	
26	"	LAX-HNL	9/17/78	1733-2152	51	O	W			A	Z	
27	"	HNL-ITO	9/18/78	0018-0018	1		W					
28	"	ITO-LAX	9/18/78	0159-0559	47	O	W			A	Z	
29	"	LAX-ORD	9/18/78	1756-2026	31	O	W			A	Z	
30	"	ORD-DTW	9/18/78	2246-2251	2		W					
31	"	DTW-ORD	9/19/78	0037-0047	3	O	W				Z	
32	"	ORD-HNL	9/19/78	1601-2336	86	O	W			A	Z	
33	"	SFO-ORD	9/21/78	2048-2329	31	O	W		P	A	Z	F
34	"	ORD-JFK	9/22/78	0206-0301	12	O	W		P	A	Z	
35	"	JFK-ORD	9/22/78	1213-1329	34	O	W		P	A	Z	
36	"	ORD-SFO	9/22/78	1532-1847	39	O	W		P	A	Z	
37	"	SFO-JFK	9/22/78	2101-0056	48	O	W	C	P	A	Z	
38	"	JFK-SFO	9/23/78	1404-1838	54	O	W	C	P	A	Z	
39	"	SFO-ORD	9/23/78	2038-2333	34	O	W		P	A	Z	
40	"	ORD-JFK	9/24/78	0136-0230	11	O	W	C	P	A	Z	
41	"	JFK-SFO	9/24/78	1535-1850	38	O	W	C	P	A	Z	
42	"	SFO-HNL	9/24/78	2105-0135	51	O	W	C	P	A	Z	
43	"	HNL-ORD	9/25/78	0343-1023	78	O	W	C	P	A	Z	
44	"	ORD-HNL	9/25/78	2310-0415	61	O	W	C	P	A	Z	
45	"	HNL-LAX	9/26/78	1000-1354	44	O	W		P	A	Z	

TABLE V - B) VL0018 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**						
46	GP392	LAX-HNL	9/26/78	1741-2233	58	O	W	C	P	A	Z	
47	"	HNL-LAX	9/27/78	0158-0537	44	O	W		P	A	Z	F
48	"	LAX-ORD	9/27/78	1735-2025	34	O	W		P	A	Z	
49	"	ORD-HNL	9/28/78	1604-2344	93	O	W	C	P	A	Z	
50	"	HNL-ORD	9/29/78	0326-1006	80	O	W	C	P	A	Z	
51	"	ORD-YYZ	9/29/78	1248-1313	6	O	W		P	A	Z	
52	"	YYZ-ORD	9/29/78	1608-1648	8	O	W		P	A	Z	
53	"	ORD-HNL	9/29/78	1852-0237	87	O	W	C	P	A	Z	
54	"	HNL-LAX	9/30/78	1930-2336	49	O	W		P	A	Z	
55	"	LAX-DEN	10/ 1/78	0149-0304	15	O	W		P	A	Z	
56	"	DEN-ORD	10/ 1/78	0442-0602	15	O	W		P	A	Z	
57	"	ORD-HNL	10/ 1/78	1601-2321	85	O	W	C	P	A	Z	
58	"	HNL-ORD	10/ 2/78	0305-1007	84	O	W	C	P	A	Z	
59	"	ORD-YYZ	10/ 2/78	1232-1257	6	O	W		P	A	Z	
60	"	YYZ-ORD	10/ 2/78	1601-1636	8	O	W		P	A	Z	
61	"	ORD-HNL	10/ 2/78	1951-0335	91	O	W	C	P	A	Z	
62	"	HNL-SFO	10/ 3/78	1958-2359	48	O	W	C	P	A	Z	F
63	"	SFO-HNL	10/ 4/78	0247-0647	49	O	W	C	P	A	Z	
64	"	HNL-LAX	10/ 4/78	1944-2353	51	O	W	C	P	A	Z	
65	"	LAX-DEN	10/ 5/78	0153-0313	17	O	W		P	A	Z	
66	"	DEN-ORD	10/ 5/78	0442-0552	15	O	W	C	P	A	Z	
67	"	ORD-DEN	10/ 5/78	1411-1541	19	O	W	C	P	A	Z	
68	"	DEN-LAX	10/ 5/78	1722-1837	16	O	W	C	P	A	Z	
69	"	LAX-HNL	10/ 5/78	2114-0144	55	O	W	C	P	A	Z	
70	"	HNL-SFO	10/ 6/78	2001-0004	2960	O	W		P	A	Z	F
					5997							

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- F - Filter Exposure
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei
- Z - Cabin Ozone

TABLE VI - FLIGHTS ON GASP TAPE VL0019

A) FILE 1 (QANTAS VH-EBE)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**	
1	GP326	SYD-CHC	1/ 5/78	0121-0319	66	W	
2	"	CHC-SYD	1/ 5/78	0523-0738	27	W	
3	"	SYD-HNL	1/ 5/78	1037-1923	114	W	
4	"	HNL-SFO	1/ 5/78	2217-0156	58	W	
5	"	SFO-HNL	1/ 6/78	0537-1016	56	W	C
6	"	HNL-SYD	1/ 6/78	1218-2045	100	W	C
7	"	SYD-HNL	1/ 7/78	1029-1904	100	W	C
8	"	HNL-SFO	1/ 7/78	2141-0107	56	W	
9	"	SFO-HNL	1/ 8/78	0532-1022	58	W	C
10	"	HNL-NAN	1/ 8/78	1218-1727	56	W	C
11	"	NAN-SYD	1/ 8/78	1857-2212	38	W	C
12	"	SYD-NAN	1/ 9/78	0131-0431	36	W	
13	"	NAN-SYD	1/ 9/78	0638-0953	39	W	
14	"	SYD-AKL	1/ 9/78	2228-0022	37	W	
15	"	AKL-MEL	1/10/78	0253-0553	34	W	
16	"	MEL-SYD	1/10/78	0750-0815	6		
17	"	SYD-HNL	1/10/78	1049-1932	118	W	C
18	"	HNL-SFO	1/10/78	2134-0053	70	W	C
19	"	SFO-HNL	1/11/78	0520-1026	59	W	C
20	"	HNL-SYD	1/11/78	1226-2130	133	W	C
21	"	SYD-MEL	1/11/78	2332-0007	8	W	
22	"	MEL-AKL	1/12/78	0218-0444	45	W	
23	"	AKL-SYD	1/12/78	0845-1100	26	W	
24	"	SYD-NAN	1/13/78	1032-1325	51	W	
25	"	NAN-HNL	1/13/78	1518-2038	64	W	C
26	"	HNL-SFO	1/13/78	2246-0229	60	W	C
27	"	SFO-HNL	1/14/78	0542-1012	67	O W	
28	"	HNL-SYD	1/14/78	1254-2144	104	O W	
29	"	SYD-MEL	1/15/78	0007-0037	7	O W	
30	"	MEL-SYD	1/15/78	0348-0420	53	O W	
31	"	SYD-HNL	1/15/78	0713-1532	147	O W	
32	"	HNL-SFO	1/15/78	1749-2104	39	W	
33	"	SFO-YVR	1/15/78	2305-0014	30	O W	
34	"	YVR-SFO	1/16/78	0237-0347	15	O W	
35	"	SFO-HNL	1/16/78	0557-1110	90	O W	
36	"	HNL-SYD	1/16/78	1332-2227	113	W	
37	"	SYD-MEL	1/17/78	0041-0116	8	W	
38	"	MEL-AKL	1/17/78	0329-0601	30	W	
39	"	AKL-SYD	1/17/78	0816-1021	23	W	
40	GP330	SYD-NAN	1/18/78	1041-1339	52	O W	
41	"	NAN-HNL	1/18/78	1522-2026	81	O W	
42	"	HNL-SFO	1/18/78	2235-0220	45	O W	
43	"	SFO-HNL	1/19/78	0523-0941	67	O W	
44	"	HNL-NAN	1/19/78	1144-1714	66	O W	
45	"	NAN-SYD	1/19/78	1859-2224	40	O W	

TABLE VI - A) VL0019 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	GP330	SYD-NAN	1/20/78	1034-1328	50	O	W	
47	"	NAN-HNL	1/20/78	1520-2029	75	O	W	
48	"	HNL-SFO	1/20/78	2248-0223	42	O	W	
49	"	SFO-HNL	1/21/78	0535-1000	50	O	W	
50	"	HNL-SYD	1/21/78	1202-2055	162	O	W	
51	"	SYD-MEL	1/21/78	2335-0010	8	O	W	
52	"	MEL-SYD	1/22/78	0348-0418	7	O	W	
53	"	SYD-HNL	1/22/78	0742-1625	116	O	W	
54	"	HNL-SFO	1/22/78	1825-2220	48	O	W	
55	"	SFO-YVR	1/23/78	0002-0132	19	O	W	
56	"	YVR-SFO	1/23/78	0336-0441	14	O	W	
57	"	SFO-HNL	1/23/78	0633-1042	189	O	W	
58	"	HNL-SYD	1/23/78	1250-2150	108	O	W	
59	"	SYD-MEL	1/24/78	0012-0043	24	O	W	
60	"	MEL-AKL	1/24/78	0322-0546	75	O	W	
61	"	AKL-SYD	1/24/78	0803-1013	27	O	W	
62	"	SYD-MEL	1/24/78	2232-2307	8	O	W	
63	"	MEL-SYD	1/25/78	0326-0359	23	O	W	
64	"	SYD-CHC	1/26/78	0055-0250	24	O	W	
65	"	CHC-SYD	1/26/78	0506-0721	27	O	W	
66	"	SYD-HNL	1/26/78	1035-1910	101	O	W	
67	"	HNL-SFO	1/26/78	2129-0116	62	O	W	
68	"	SFO-HNL	1/27/78	0530-0937	94	O	W	
69	"	HNL-NOU	1/27/78	1149-2024	103	O	W	
70	"	NOU-SYD	1/27/78	2248-0053	25	O	W	
71	"	SYD-HNL	1/28/78	1058-1914	123	O	W	
72	"	HNL-SFO	1/28/78	2255-0245	43		W	
73	"	SFO-HNL	1/29/78	0614-1034	68		W	
74	"	HNL-NAN	1/29/78	1253-1818	64		W	
75	"	NAN-SYD	1/29/78	1959-2324	40		W	
76	"	SYD-NAN	1/30/78	0157-0457	22		W	
77	"	NAN-SYD	1/30/78	0647-1009	59		W	
78	"	SYD-AKL	1/30/78	2231-0031	23	O	W	
79	"	AKL-MEL	1/31/78	0247-0529	32	O	W	
80	"	MEL-SYD	1/31/78	0756-0826	7		W	
81	"	SYD-HNL	1/31/78	1030-1845	97		W	
82	"	HNL-SFO	1/31/78	2121-0101	44		W	
83	GP333	SFO-HNL	2/ 1/78	0538-1018	54	O	W	
84	"	HNL-SYD	2/ 1/78	1225-2118	103	O	W	
85	"	SYD-HNL	2/ 2/78	1032-1857	96	O	W	
86	"	HNL-SFO	2/ 2/78	2131-0114	61	O	W	
87	"	SFO-HNL	2/ 3/78	0531-1001	50	O	W	A
88	"	HNL-SYD	2/ 3/78	1211-2036	99	O	W	A
89	"	SYD-HNL	2/ 4/78	1026-1909	102	O	W	A
90	"	HNL-SFO	2/ 4/78	2144-0106	64	O	W	A

TABLE VI - A) VL0019 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
91	GP333	SFO-HNL	2/ 5/78	0527-1012	56	O	W	A
92	"	HNL-NAN	2/ 5/78	1223-1728	60	O	W	A
93	"	NAN-SYD	2/ 5/78	1915-2225	37	O	W	A
94	"	SYD-MEL	2/ 6/78	0022-0104	14	O	W	A
95	"	MEL-SYD	2/ 6/78	0758-0828	7	O	W	A
96	"	SYD-HND	2/ 6/78	1150-2031	103	O	W	A
97	"	HND-SYD	2/ 7/78	1209-2024	98	O	W	A
98	"	SYD-BNE	2/ 9/78	0053-0125	21	O	W	A
99	"	BNE-DRW	2/ 9/78	0325-0615	34	O	W	A
100	"	DRW-SIN	2/ 9/78	0810-1126	38	O	W	A
101	"	SIN-DRW	2/ 9/78	1511-1831	39	O	W	A
102	"	DRW-BNE	2/ 9/78	2023-2313	35	O	W	A
103	"	BNE-SYD	2/10/78	0040-0120	8	O	W	A
104	"	SYD-AKL	2/10/78	2229-0024	21	O	W	A
105	"	AKL-MEL	2/11/78	0248-0547	51	O	W	A
106	"	MEL-SYD	2/11/78	0746-0811	52	O	W	A
107	"	SYD-HNL	2/11/78	1046-1924	119	O	W	A
108	"	HNL-SFO	2/11/78	2151-0121	42	O	W	A
109	"	SFO-HNL	2/12/78	0528-1018	58	O	W	A
110	"	HNL-SYD	2/12/78	1232-2144	111	O	W	A
111	"	SYD-MEL	2/13/78	0018-0058	9	O	W	A
112	"	MEL-SYD	2/13/78	0755-0831	21	O	W	A
113	GP340	SYD-AKL	2/13/78	2228-0028	24	O	W	A
114	"	AKL-MEL	2/14/78	0240-0525	33	O	W	A
115	"	MEL-SYD	2/14/78	0747-0817	7	O	W	A
116	"	SYD-HNL	2/14/78	1027-1849	131	O	W	A
117	"	HNL-SFO	2/14/78	2121-0103	60	O	W	A
118	"	SFO-HNL	2/15/78	0537-1005	54	O	W	
119	"	HNL-SYD	2/15/78	1210-2104	131	O	W	C
120	"	SYD-MEL	2/15/78	2316-2336	5	O	W	
121	"	MEL-AKL	2/16/78	0205-0435	24		W	
122	"	AKL-SYD	2/16/78	0645-0855	20		W	A
123	"	SYD-HNL	2/18/78	1602-1851	30	O	W	A
124	"	HNL-SFO	2/18/78	2137-0124	66	O	W	A
125	"	SFO-HNL	2/19/78	0541-1002	258	O	W	A
126	"	HNL-SYD	2/19/78	1205-2050	148	O	W	C A
127	"	SYD-MEL	2/19/78	2259-2329	6	O	W	
128	"	MEL-SYD	2/20/78	0752-0824	38	O	W	
129	"	SYD-AKL	2/20/78	2232-0032	25	O	W	
130	"	AKL-MEL	2/21/78	0240-0529	49	O	W	A
131	"	MEL-SYD	2/21/78	0744-0817	8	O	W	A
132	"	SYD-HNL	2/21/78	1028-1910	103	O	W	A
133	"	HNL-SFO	2/21/78	2130-0109	57	O	W	A
134	"	SFO-HNL	2/22/78	0536-1003	80	O	W	A
135	"	HNL-SYD	2/22/78	1224-2120	107	O	W	A

TABLE VI - A) VL0019 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
136	GP340	SYD-MEL	2/22/78	2336-0009	38	O	W	A
137	"	MEL-AKL	2/23/78	0205-0435	31	O	W	A
138	"	AKL-SYD	2/23/78	0643-0853	27	O	W	A
139	"	SYD-HNL	2/24/78	1042-1917	100	O	W	A
140	"	HNL-SFO	2/24/78	2130-0120	47	O	W	A
141	"	SFO-HNL	2/25/78	0523-0953	53	O	W	A
142	"	HNL-SYD	2/25/78	1221-2110	106	O	W	A
143	"	SYD-MEL	2/25/78	2313-2344	5		W	A
144	"	SYD-HNL	2/26/78	0711-1441	67	O	W	A
145	"	HNL-SFO	2/26/78	1910-2045	20	O	W	A
146	"	SFO-YVR	2/26/78	2245-2355	43		W	A
147	"	YVR-SFO	2/27/78	0223-0338	15	O	W	A
148	"	SFO-HNL	2/27/78	0534-1008	119	O	W	A
149	"	HNL-SYD	2/27/78	1227-2105	111	O	W	A
150	"	SYD-MEL	2/27/78	2305-2340	8	O	W	A
151	"	MEL-AKL	2/28/78	0205-0442	47	O	W	A
152	"	AKL-SYD	2/28/78	0653-0913	29	O	W	A
153	"	SYD-HKG	3/ 2/78	0226-1020	106	O	W	A
154	"	HKG-SYD	3/ 2/78	1305-2046	108	O	W	A
155	"	SYD-AKL	3/ 3/78	0200-0350	23	O	W	A
156	"	AKL-SYD	3/ 3/78	0636-0851	27	O	W	A
157	"	SYD-AKL	3/ 3/78	2243-0038	24	O	W	A
158	"	AKL-MEL	3/ 4/78	0250-0538	49	O	W	A
159	"	MEL-SYD	3/ 4/78	0759-0834	7	O	W	A
160	"	SYD-HNL	3/ 4/78	1032-1903	116	O	W	A
					9148			

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- C - Carbon Monoxide
- A - Condensation Nuclei

TABLE VI - FLIGHTS ON GASP TAPE VL0019

B) FILE 2 (PANAM-N655PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
1	GP329	SFO-HND	1/ 9/78	2144-0655	109	O		C	A	F
2	"	HND-SFO	1/10/78	1044-1825	168	O		C		
3	"	SFO-HNL	1/11/78	0530-0700	17	O	W	C		
4	"	LAX-GUA	1/14/78	2014-2244	30	O	W	C		
5	"	GUA-SJO	1/15/78	0045-0123	8	O	W			F
6	"	SJO-PTY	1/15/78	0318-0339	19	O	W			
7	"	PTY-SJO	1/15/78	1226-1251	6	O	W	C		
8	"	SJO-GUA	1/15/78	1423-1503	9	O	W			
9	"	GUA-LAX	1/15/78	1758-2208	51	O	W	C		
10	"	LAX-SFO	1/16/78	0117-0147	7		W			
11	"	SFO-LAX	1/16/78	1602-1627	66	O				
12	"	LAX-GUA	1/16/78	1850-2210	38	O	W	C		
13	"	GUA-CCS	1/17/78	0033-0307	45	O	W	C		
14	"	CCS-GIG	1/17/78	0532-1031	72	O	W	C		
15	"	GIG-VCP	1/17/78	1218-1238	5	O				
16	"	VCP-GIG	1/18/78	0258-0308	3	O				
17	"	GIG-CCS	1/18/78	0506-0945	54	O	W	C		
18	"	CCS-GUA	1/18/78	1245-1530	32	O	W	C		
19	"	GUA-LAX	1/18/78	1809-2234	53	O	W	C		
20	"	LAX-SFO	1/19/78	0103-0133	7	O	W			
21	"	SFO-LAX	1/19/78	1603-1628	5		W			
22	"	LAX-GUA	1/19/78	1845-2210	41	O	W	C		
23	"	GUA-PTY	1/20/78	0149-0259	14	O	W	C		
24	"	PTY-GIG	1/20/78	0520-1050	65	O	W	C		
25	"	GIG-CCS	1/21/78	1506-1953	71	O	W	C		
26	"	CCS-LAX	1/21/78	2215-0501	95	O	W	C		
27	"	LAX-SFO	1/22/78	0810-0835	6	O	W	C		
28	"	SFO-LAX	1/22/78	1556-1621	6	O	W			
29	"	LAX-GUA	1/22/78	1955-2323	95	O	W	C		
30	"	GUA-LAX	1/23/78	2050-0110	53	O	W	C		
31	"	LAX-SFO	1/24/78	0316-0341	6	O	W	C		
32	"	SFO-SEA	1/24/78	1930-2035	13	O	W	C		
33	"	SEA-LHR	1/24/78	2233-0703	101	O	W	C		
34	"	LHR-IAD	1/25/78	0000-0000M	151	O	W	C		
35	"	IAD-LHR	1/26/78	0248-0816	77	O	W	C		
36	"	LHR-JFK	1/26/78	1146-1847	144	O	W	C		
37	GP335	JFK-FRA	1/26/78	2346-0131	21	O	W	C		
38	GP338	JFK-LHR	2/19/78	0437-0632	24		W			
39	"	LHR-FRA	2/19/78	0830-0900	7		W			
40	"	FRA-THR	2/19/78	1119-1501	59		W			
41	"	THR-BKK	2/19/78	1716-2221	60		W			
42	"	BKK-HKG	2/20/78	0035-0321	34		W			
43	"	HKG-HND	2/20/78	0607-0847	31		W			
44	"	HND-HNL	2/20/78	1242-1747	59		W			
45	"	HNL-SEA	2/20/78	2205-0216	79		W			

TABLE VI - B) VL0019 FILE 2 CONTINUED....

	FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**
46	GP338 SEA-FAI	2/21/78	0556-0836	30	W
47	" FAI-SEA	2/21/78	1110-1330	27	W
48	" SEA-HNL	2/21/78	1744-2249	138	W
49	" HNL-LAX	2/22/78	0125-0525	47	W
50	" LAX-HNL	2/22/78	1645-2140	57	W
51	" HNL-HND	2/22/78	2337-0801	100	W
52	" HND-HKG	2/23/78	1016-1416	48	W
53	" HKG-DEL	2/23/78	1651-2311	72	W
54	" DEL-THR	2/24/78	0108-0418	38	W
55	" THR-FRA	2/24/78	0600-1035	54	W
56	" FRA-LHR	2/24/78	1256-1331	8	W
57	" LHR-JFK	2/24/78	1540-2155	72	W
58	" JFK-LHR	2/25/78	0155-0744	84	W
59	" LHR-FRA	2/25/78	1024-1054	6	W
60	" FRA-THR	2/25/78	1331-1732	49	W
61	" THR-DEL	2/25/78	2029-2304	32	W
62	" DEL-HKG	2/25/78	2354-0540	67	W
63	" HKG-HND	2/26/78	0734-1009	32	W
64	" HND-HNL	2/26/78	1329-1839	59	W
65	" HNL-LAX	2/26/78	2117-0105	46	W
66	" LAX-HNL	2/27/78	0442-0937	57	W
67	" HNL-NAN	2/27/78	1157-1717	62	W
68	" NAN-SYD	2/27/78	1906-2301	63	W
69	" SYD-MEL	2/28/78	0050-0125	8	W
70	" MEL-SYD	2/28/78	0411-0435	21	W
71	" SYD-AKL	2/28/78	0639-0839	25	W
72	" AKL-HNL	2/28/78	1104-1816	155	W
73	" HNL-SFO	2/28/78	2142-0117	44	W
74	GP339 SFO-LAX	3/ 1/78	1550-1615	6	W
75	GP341 SFO-LAX	3/ 4/78	1602-1631	87	W
76	" LAX-GUA	3/ 4/78	1934-2259	39	W
77	" GUA-SJO	3/ 5/78	0104-0144	8	W
78	" SJO-PTY	3/ 5/78	0330-0355	6	W
79	" PTY-SJO	3/ 5/78	1224-1244	5	W
80	" SJO-GUA	3/ 5/78	1428-1513	10	W
81	" GUA-LAX	3/ 5/78	1810-2156	75	W
82	" LAX-SFO	3/ 6/78	0020-0050	7	W
				3860	

\+ Number of DATA records
M GASP GMT not available for one or more data points
** Constituent measurements: O - Ozone
W - Water Vapor
F - Filter Exposure
C - Carbon Monoxide
A - Condensation Nuclei

TABLE VI - FLIGHTS ON GASP TAPE VL0019

C) FILE 3 (PANAM-N655PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
1	GP346	SFO-SEA	3/ 6/78	1954-2049	12		W	C
2	"	SEA-LHR	3/ 6/78	2239-0639	90		W	C
3	"	LHR-JFK	3/ 7/78	1136-1801	75		W	
4	"	JFK-FRA	3/ 7/78	2345-0550	72		W	C
5	"	FRA-JFK	3/ 8/78	1412-2155	107		W	C
6	"	JFK-FCO	3/10/78	0056-0752	95		W	C
7	"	FCO-JFK	3/10/78	1429-2306	162		W	C
8	"	JFK-GIG	3/11/78	0311-1114	111		W	C
9	"	GIG-CCS	3/11/78	1645-2144	74		W	C
10	"	CCS-LAX	3/11/78	2355-0645	82		W	C
11	"	LAX-SFO	3/12/78	0857-0922	6		W	
12	"	SFO-LAX	3/12/78	1607-1627	5		W	
13	"	LAX-GUA	3/12/78	1843-2213	42		W	C
14	"	GUA-LAX	3/14/78	1649-2139	47		W	C
15	"	LAX-SFO	3/15/78	0007-0037	7		W	
16	"	SFO-SEA	3/15/78	1935-2037	14	O	W	
17	"	SEA-LHR	3/15/78	2227-0708	102	O	W	C
18	"	LHR-JFK	3/16/78	1205-1848	91		W	F
19	"	JFK-GIG	3/18/78	0328-1136	83	O	W	C
20	"	GIG-CCS	3/18/78	1512-2012	60	O	W	C
21	"	CCS-LAX	3/18/78	2313-0538	77	O	W	C
22	"	LAX-SFO	3/19/78	0843-0903	5		W	
23	"	SFO-LAX	3/19/78	1613-1630	4	O		F
24	"	LAX-GUA	3/19/78	1950-2306	54	O	W	C
25	"	GUA-LAX	3/21/78	1737-2143	95	O	W	C
26	"	LAX-SFO	3/22/78	0007-0034	15	O	W	
27	"	SFO-SEA	3/22/78	1922-2022	12	O	W	C
28	"	SEA-LHR	3/22/78	2230-0620	90	O	W	C
29	"	LHR-BOS	3/23/78	1111-1741	75	O	W	C
30	"	BOS-DTW	3/23/78	1949-2049	12		W	
31	"	DTW-BOS	3/23/78	2305-2350	10	O	W	C
32	"	BOS-LHR	3/24/78	0158-0653	58	O	W	C
33	"	LHR-JFK	3/24/78	1115-1803	79	O	W	
34	"	JFK-ORD	3/24/78	2100-2228	48		W	
35	"	ORD-LAS	3/25/78	0103-0333	31		W	
36	"	LAS-ORD	3/25/78	0612-0837	29		W	
37	"	ORD-STL	3/25/78	2245-2300	4	O	W	
38	"	STL-HNL	3/26/78	0129-0859	86	O	W	C
39	"	HNL-STL	3/26/78	1145-1836	82	O	W	C
40	"	STL-ORD	3/26/78	2025-2040	3			
41	"	ORD-ACA	3/27/78	0135-0445	37		W	
42	"	ACA-ORD	3/27/78	0730-1043	38		W	
43	"	ORD-LAS	3/27/78	1710-1949	31		W	
44	"	LAS-ORD	3/27/78	2323-0144	29		W	
45	"	ORD-JFK	3/28/78	0443-0548	13		W	

TABLE VI - C) VL0019 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	GP351	JFK-LHR	3/28/78	1523-2041	63	O	W	C
47	"	LHR-AMS	3/28/78	2226-2241	4	O		
48	"	AMS-LHR	3/29/78	0808-0823	3			
49	"	LHR-IAD	3/29/78	1219-1924	82	O	W	C
50	"	JFK-FRA	3/30/78	0120-0705	66	O	W	C
51	"	FRA-JFK	3/30/78	1034-1744	85	O	W	C
52	"	IAD-LHR	3/31/78	0218-0745	64	O	W	C
53	"	LHR-IAD	3/31/78	1229-1915	79		W	
54	"	JFK-FRA	4/ 1/78	0142-0729	59		W	
55	"	FRA-JFK	4/ 1/78	1114-1819	80		W	
56	"	IAD-LHR	4/ 2/78	0222-0802	67		W	
57	"	LHR-IAD	4/ 2/78	1222-1907	79	O	W	C
58	"	IAD-LHR	4/ 3/78	0213-0813	72	O	W	C
59	"	LHR-SEA	4/ 3/78	1516-2341	96		W	
60	"	SEA-SFO	4/ 4/78	0232-0337	13	O	W	C
61	"	SFO-HND	4/ 4/78	2151-0723	109	O	W	C
62	"	HND-SFO	4/ 5/78	1058-1851	117	O	W	C
63	"	SFO-HND	4/ 5/78	2158-0801	173	O	W	C
64	"	HND-SFO	4/ 6/78	1429-2239	98	O	W	C
65	"	SFO-HNL	4/ 7/78	0534-0934	49	O	W	C
66	"	HNL-GUM	4/ 7/78	1228-1913	82	O	W	C
67	"	GUM-MNL	4/ 7/78	2153-0023	30	O	W	C
68	"	MNL-GUM	4/ 8/78	0602-0837	31	O	W	C
69	"	GUM-HNL	4/ 8/78	1123-1728	72	O	W	C
70	"	HNL-LAX	4/ 8/78	2213-0228	50	O	W	C
71	"	LAX-HNL	4/ 9/78	0536-1005	55	O	W	C
72	"	HNL-LAX	4/ 9/78	2059-0109	46	O	W	C
73	"	LAX-HNL	4/10/78	0441-0911	49	O	W	C
74	"	HNL-AKL	4/10/78	1158-1945	74	O	W	C
75	"	AKL-SYD	4/10/78	2146-0001	27	O	W	C
76	"	SYD-MEL	4/11/78	0206-0241	36	O	W	C
77	"	MEL-SYD	4/11/78	0516-0546	7	O	W	
78	"	SYD-NAN	4/11/78	2308-0158	34	O	W	C
79	"	NAN-HNL	4/12/78	0357-0901	75	O	W	C
80	"	HNL-LAX	4/12/78	1212-1614	49	O	W	C
81	"	LAX-SFO	4/12/78	1812-1832	5	O		
82	GP359	SFO-HND	4/13/78	2143-0718	112	O	W	C
83	"	HND-SFO	4/14/78	1056-1926	101	O	W	C
84	"	SFO-HNL	4/15/78	0544-0954	50		W	
85	"	HNL-GUM	4/15/78	1230-1927	108		W	
86	"	GUM-OKA	4/15/78	2144-0009	28		W	
87	"	OKA-TPE	4/16/78	0145-0220	8		W	
88	"	TPE-OKA	4/16/78	0513-0533	5		W	
89	"	OKA-GUM	4/16/78	0706-0911	24	O	W	C
90	"	GUM-HNL	4/16/78	1122-1657	65	O	W	C

TABLE VI - C) VL0019 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**
91	GP359	HNL-SEA	4/16/78	2201-0223	67	O W C
92	"	SEA-FAI	4/17/78	0558-0818	26	O W C
93	"	FAI-SEA	4/17/78	1112-1342	27	O W C
94	"	SEA-HNL	4/17/78	1738-2133	42	O W C
95	"	JFK-GIG	4/23/78	1536-2315	90	W
96	"	GIG-VCP	4/24/78	0129-0147	27	
97	"	VCP-GIG	4/24/78	0342-0352	3	
98	"	GIG-CCS	4/24/78	0531-1036	59	W
99	"	CCS-GUA	4/24/78	1300-1535	31	W
100	"	GUA-LAX	4/24/78	1754-2144	47	W
101	"	LAX-SFO	4/25/78	0008-0028	5	
102	"	SFO-HNL	4/25/78	0551-1006	48	W
103	"	HNL-GUM	4/25/78	1219-1859	77	W
104	"	GUM-OKA	4/25/78	2152-2237	10	W
105	"	OKA-TPE	4/26/78	0150-0220	7	W
106	"	TPE-OKA	4/26/78	0445-0505	5	
107	"	OKA-GUM	4/26/78	0627-0837	26	W
108	"	GUM-HNL	4/26/78	1122-1712	68	W
109	"	HNL-LAX	4/26/78	2237-0237	46	W
110	"	LAX-HNL	4/27/78	0517-0952	53	W
111	"	HNL-NAN	4/27/78	1256-1836	65	W
112	"	NAN-SYD	4/27/78	2006-2346	42	W
113	"	SYD-MEL	4/28/78	0144-0219	8	W
114	"	MEL-SYD	4/28/78	0407-0437	6	W
115	"	SYD-AKL	4/28/78	0629-0826	40	W
116	"	AKL-HNL	4/28/78	1055-1800	81	W
117	"	HNL-SFO	4/28/78	2131-0131	47	W
118	"	SFO-SEA	4/29/78	1930-2030	13	W
119	"	SEA-PIK	4/29/78	2233-0658	97	W
120	"	PIK-LHR	4/30/78	0855-0915	5	W
121	"	LHR-BOS	4/30/78	1222-1803	81	W
122	"	BOS-DTW	4/30/78	2052-2150	29	W
123	"	DTW-BOS	4/30/78	2353-0038	7	W
124	"	BOS-LHR	5/ 1/78	0235-0800	60	W
125	"	LHR-DUB	5/ 1/78	1030-1045	3	
126	"	DUB-BOS	5/ 1/78	1326-1825	57	W
127	"	JFK-STR	5/ 1/78	2344-0548	71	W
128	"	FRA-JFK	5/ 2/78	1541-2238	80	W
					6591	

\+ Number of DATA records
** Constituent measurements: O - Ozone
W - Water Vapor
F - Filter Exposure
C - Carbon Monoxide

TABLE VII - FLIGHTS ON GASP TAPE VL0020

A) FILE 1 (PANAM-N655PA)

	FLIGHT	ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**					
1	GP374	SFO-HND	5/16/78	2056-0655	115	O	W	C			
2	"	HND-HNL	5/17/78	1335-1933	72	O	W	C			
3	"	HNL-PDX	5/17/78	2216-0223	63	O	W	C			
4	"	SEA-FAI	5/18/78	0548-0724	20	O	W				
5	"	FAI-SEA	5/18/78	1048-1303	26	O	W	C			
6	"	PDX-HNL	5/18/78	1721-2152	52	O	W	C			F
7	"	HNL-LAX	5/19/78	0109-0504	45	O	W	C			
8	"	LAX-HNL	5/19/78	1658-2126	53		W				
9	"	HNL-HND	5/19/78	2351-0646	110		W				
10	"	HND-HKG	5/20/78	0917-1253	72		W				
11	"	HKG-BKK	5/20/78	1513-1759	34		W				
12	"	BKK-THR	5/20/78	1952-0212	73	O	W	C			
13	"	THR-FRA	5/21/78	0418-0853	55	O	W	C			
14	"	FRA-LHR	5/21/78	1034-1109	7	O	W	C			
15	"	LHR-JFK	5/21/78	1307-1937	76	O	W	C			
16	"	JFK-FRA	5/22/78	0134-0744	74	O	W	C			
17	"	FRA-JFK	5/22/78	1345-2045	81	O	W	C			
18	GP370	JFK-LHR	5/22/78	2351-0511	64	O	W	C	P		
19	"	LHR-FRA	5/23/78	0759-0829	7	O	W	C			
20	"	FRA-THR	5/23/78	1040-1432	76	O	W	C			
21	"	THR-DEL	5/23/78	1646-1915	45	O	W	C	P		
22	"	DEL-HKG	5/23/78	2114-0319	71		W		P		
23	"	HKG-NRT	5/24/78	0550-0840	35		W				
24	"	NRT-LAX	5/24/78	1121-1946	102		W				
25	"	LAX-JFK	5/24/78	2355-0350	47		W				
26	"	JFK-ATH	5/25/78	0950-1815	98		W		P		
27	"	ATH-BRU	5/25/78	2309-0119	26		W		P		
28	"	BRU-JFK	5/26/78	0519-1154	93		W				
29	"	JFK-LAX	5/26/78	1744-2159	51	O	W	C	P		
30	"	LAX-HNL	5/27/78	0212-0637	51	O	W	C	P		
31	"	HNL-PPG	5/27/78	0936-1351	52	O	W		P		
32	"	PPG-PPT	5/27/78	1533-1745	40	O	W		P		
33	"	PPT-LAX	5/28/78	0629-1324	82	O	W	C	P		
34	"	LAX-GUA	5/28/78	1800-2130	41	O	W		P		
35	"	GUA-CCS	5/29/78	0011-0246	32	O	W	C	P		
36	"	CCS-GIG	5/29/78	0532-0642	14	O			P		
37	GP376	SFO-NRT	5/31/78	2105-0655	115	O	W	C	P	A	
38	"	NRT-HNL	6/ 1/78	1251-1903	74	O	W	C	P	A	
39	"	HNL-PDX	6/ 1/78	2147-0201	50	O	W		P	A	
40	"	SEA-FAI	6/ 2/78	0543-0808	30	O	W		P	A	
41	"	FAI-SEA	6/ 2/78	1034-1314	31	O	W	C	P	A	
42	"	PDX-HNL	6/ 2/78	1719-2154	52	O	W	C	P	A	
43	"	HNL-LAX	6/ 3/78	0055-0450	47	O	W		P	A	
44	"	LAX-HNL	6/ 3/78	1623-2103	54	O	W		P	A	
45	"	HNL-NRT	6/ 4/78	0001-0635	80	O	W		P	A	

TABLE VII - A) VL0020 FILE 1 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
46	"	NRT-HKG	6/ 4/78	0923-1307	61	O	W	P A
47	"	HKG-DEL	6/ 4/78	1507-2110	131	O	W	P A
48	"	DEL-THR	6/ 5/78	0017-0254	45	O	W	P A
49	"	THR-FRA	6/ 5/78	0532-0959	54	O	W	P A
50	"	FRA-LHR	6/ 5/78	1213-1248	8	O	W	P A
51	"	LHR-JFK	6/ 5/78	1501-2138	107	O	W	P A
52	"	JFK-LHR	6/ 6/78	1459-2012	62	O	W	P A
53	"	LHR-AMS	6/ 6/78	2157-2210	19	O		P
54	"	AMS-LHR	6/ 7/78	0818-0823	2			P
55	"	LHR-JFK	6/ 7/78	1102-1738	77	O	W	P A
56	"	JFK-FRA	6/ 7/78	2252-0457	69	O	W	P A
57	"	FRA-JFK	6/ 8/78	1117-1848	116	O	W	P A
58	"	JFK-FCO	6/ 9/78	0007-0712	91	O	W	P A
59	"	FCO-JFK	6/ 9/78	1208-2014	112	O	W	P A
60	"	JFK-LHR	6/10/78	0240-0804	99	O		P A
61	"	LHR-IAD	6/10/78	1100-1740	77	O		P A
62	"	IAD-DTW	6/10/78	1938-2008	7	O		P A
63	"	DTW-IAD	6/10/78	2241-2311	7	O		P A
64	"	IAD-LHR	6/11/78	0112-0708	105	O		P A
65	"	LHR-SEA	6/11/78	1047-1907	98	O		P A
66	"	SEA-LHR	6/12/78	0140-0950	96	O		P A
67	"	LHR-SFO	6/12/78	1306-2242	127	O		P A
					4158			

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei

TABLE VII - FLIGHTS ON GASP TAPE VL0020

B) FILE 2 (PANAM-N655PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
1	GP373	SFO-LHR	6/13/78	0247-1126	119	O		P	A	
2	"	LHR-JFK	6/13/78	1617-2242	93	O		P	A	
3	"	JFK-LHR	6/16/78	0046-0609	64	O		P	A	
4	"	LHR-FRA	6/16/78	0849-0914	6	O	C	P	A	
5	"	FRA-THR	6/16/78	1153-1537	61	O	C	P	A	
6	"	THR-DEL	6/16/78	1749-2016	30	O	C	P	A	
7	"	DEL-HKG	6/16/78	2233-0443	70	O	C	P	A	
8	"	HKG-NRT	6/17/78	0644-0950	38	O	C	P	A	F
9	"	NRT-LAX	6/17/78	1222-2110	118	O	C	P	A	
10	"	LAX-JFK	6/18/78	0102-0449	60	O	C	P	A	
11	"	JFK-FCO	6/18/78	0717-1445	156	O	C	P	A	
12	"	FCO-ATH	6/18/78	1635-1740	13	O	C	P	A	
13	"	ATH-PIK	6/18/78	2111-0031	38	O	C	P	A	
14	"	PIK-BGR	6/19/78	0207-0735	78	O	C	P	A	
15	"	BGR-LAX	6/19/78	1133-1645	91	O	C	P	A	
16	"	LAX-SFO	6/19/78	1846-1911	6	O		P	A	
17	"	SFO-NRT	6/19/78	2238-0801	142	O	C	P	A	
18	"	NRT-HNL	6/20/78	1243-1848	73	O	C	P	A	
19	"	HNL-PDX	6/20/78	2308-0328	52	O	C	P	A	
20	"	SEA-FAI	6/21/78	0702-0937	32	O	C	P	A	
21	"	FAI-SEA	6/21/78	1300-1510	27	O	C	P	A	
22	"	PDX-HNL	6/21/78	1918-2338	53	O	C	P	A	
23	"	HNL-LAX	6/22/78	0205-0553	79	O	C		A	
24	"	LAX-HNL	6/22/78	1711-2156	58	O	C		A	
25	"	HNL-NRT	6/23/78	0017-0640	77	O	C		A	
26	"	NRT-HKG	6/23/78	0917-1237	41	O	C		A	
27	"	HKG-DEL	6/23/78	1430-2021	131	O	C		A	
28	"	DEL-THR	6/23/78	2240-0110	82	O	C		A	
29	"	THR-FRA	6/24/78	0429-0853	60	O	C		A	
30	"	FRA-LHR	6/24/78	1118-1148	22	O			A	
31	"	LHR-JFK	6/24/78	1434-2036	147	O	C		A	
32	"	JFK-FCO	6/25/78	0027-0708	106	O	C		A	
33	"	FCO-JFK	6/25/78	1229-2008	125	O	C		A	
34	"	JFK-LHR	6/25/78	2347-0522	68	O	C		A	
35	"	LHR-FRA	6/26/78	0848-0907	4	O				
36	"	FRA-THR	6/26/78	1113-1459	45	O	C		A	
37	"	THR-DEL	6/26/78	1720-1955	32	O	C		A	
38	"	DEL-HKG	6/26/78	2149-0403	122	O	C		A	
39	"	HKG-NRT	6/27/78	0611-0911	69	O	C		A	
40	"	NRT-LAX	6/27/78	1146-2051	109	O	C		A	
41	"	LAX-HNL	6/28/78	0354-0829	56	O	C		A	
42	"	HNL-NAN	6/28/78	1103-1604	77	O	C		A	
43	"	NAN-SYD	6/28/78	1819-2204	64	O	C		A	
44	"	SYD-MEL	6/29/78	0008-0038	7	O	C		A	
45	"	MEL-SYD	6/29/78	0252-0322	7	O	C		A	

TABLE VII - B) VL0020 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
46	GP373	SYD-AKL	6/29/78	0532-0722	23	O	C		A
47	"	AKL-HNL	6/29/78	0943-1649	139	O	C		A
48	"	HNL-LAX	6/29/78	2027-0012	45	O	C		A
49	"	LAX-HNL	6/30/78	0410-0845	55	O	C		A
50	"	HNL-NAN	6/30/78	1058-1615	191	O	C		A
51	"	NAN-SYD	6/30/78	1823-2211	68	O	C		A
52	"	SYD-MEL	7/ 1/78	0132-0202	7	O	C		A
53	"	MEL-SYD	7/ 1/78	0426-0452	6	O	C		A
54	"	SYD-NAN	7/ 1/78	0717-0957	33	O	C		A
55	"	NAN-HNL	7/ 1/78	1153-1704	91	O	C		A
56	"	HNL-LAX	7/ 1/78	2054-0028	43	O	C		A
57	"	LAX-HNL	7/ 2/78	0432-0917	57	O	C		A
58	"	HNL-LAX	7/ 2/78	2016-2356	45	O	C		A
59	"	LAX-SFO	7/ 3/78	0218-0238	5	O	C		A
60	GP381	SFO-NRT	7/ 3/78	2054-0604	111	O	C	P	A
61	"	NRT-HNL	7/ 4/78	1240-1910	79	O	C	P	A
62	"	HNL-PDX	7/ 4/78	2242-0242	49	O	C	P	A
63	"	SEA-FAI	7/ 5/78	0629-0849	29	O	C	P	A
64	"	FAI-SEA	7/ 5/78	1044-1314	31	O	C	P	A
65	"	PDX-HNL	7/ 5/78	1726-2159	48	O	C	P	A
66	"	HNL-LAX	7/ 6/78	0103-0503	49	O	C	P	A
67	"	LAX-HNL	7/ 6/78	1659-2134	72	O	C	P	A
68	"	HNL-NRT	7/ 7/78	0001-0626	78	O	C	P	A
69	"	NRT-HKG	7/ 7/78	0909-1209	37	O	C	P	A
70	"	HKG-DEL	7/ 7/78	1426-2017	162	O	C	P	A
71	"	DEL-THR	7/ 7/78	2243-0122	53	O	C	P	A
72	"	THR-FRA	7/ 8/78	0511-0931	53	O	C	P	A
73	"	FRA-LHR	7/ 8/78	1146-1218	23	O	C	P	A
74	"	LHR-JFK	7/ 8/78	1524-2133	73	O	C	P	A
75	"	JFK-LHR	7/ 9/78	0211-0741	67	O	C	P	A
76	"	LHR-IAD	7/ 9/78	1040-1703	77	O	C	P	A
77	"	IAD-DTW	7/ 9/78	1907-1933	6	O	C	P	A
78	"	DTW-IAD	7/ 9/78	2309-2334	6	O		P	A
79	"	IAD-LHR	7/10/78	0204-0759	72	O	C	P	A
80	"	LHR-SEA	7/10/78	1151-2011	101	O	C	P	A
81	"	SEA-LHR	7/11/78	0156-0943	105	O	C	P	A
82	"	LHR-SFO	7/11/78	1340-2310	115	O	C	P	A
83	"	SFO-HNL	7/12/78	0458-0903	50	O	C	P	A
84	"	HNL-GUM	7/12/78	1221-1853	128	O	C	P	A
85	"	GUM-MNL	7/12/78	2120-2340	29	O	C	P	A
86	"	MNL-GUM	7/13/78	0506-0741	32	O	C	P	A
87	"	GUM-HNL	7/13/78	1032-1642	110	O	C	P	A
88	"	HNL-SFO	7/13/78	2001-2336	43	O	C		A
89	"	SFO-LAX	7/14/78	1459-1522	4				
90	"	LAX-GUA	7/14/78	1747-2127	44	O	C		A
91	"	GUA-CCS	7/14/78	2356-0231	32	O	C		A
92	"	CCS-GUA	7/15/78	1157-1427	31	O	C		A

TABLE VII - B) VL0020 FILE 2 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**		
93	GP381	GUA-LAX	7/15/78	1714-2039	42	O	C	A
94	"	LAX-SFO	7/15/78	2343-0000M	19	O		
95	"	SFO-HNL	7/16/78	0637-1102	54	O	C	A
96	"	HNL-GUM	7/16/78	1353-2020	141	O	C	A
97	"	GUM-MNL	7/16/78	2238-0115	90	O	C	A
98	"	MNL-GUM	7/17/78	0509-0730	27	O	C	A
99	"	GUM-HNL	7/17/78	1021-1626	73	O	C	A
100	"	HNL-SFO	7/17/78	2005-2345	45	O	C	A
101	"	SFO-LAX	7/18/78	1456-1515	5	O		A
102	"	LAX-GUA	7/18/78	1748-2128	45	O	C	A
103	"	GUA-CCS	7/19/78	0024-0315	131	O		A
104	"	CCS-GUA	7/19/78	1140-1405	60	O	C	A
105	"	GUA-LAX	7/19/78	1655-2030	44	O	C	A
106	"	LAX-SFO	7/19/78	2305-2325	5	O	C	A
107	"	SFO-HNL	7/20/78	0543-0948	48	O	C	A
108	"	HNL-GUM	7/20/78	1219-1854	78	O	C	A
109	"	GUM-OKA	7/20/78	2137-2347	27	O	C	A
110	"	OKA-TPE	7/21/78	0112-0137	6	O		A
111	"	TPE-OKA	7/21/78	0359-0419	5	O		A
112	"	OKA-GUM	7/21/78	0549-0801	44	O	C	A
113	"	GUM-HNL	7/21/78	1038-1658	77	O	C	A
114	"	HNL-SFO	7/21/78	2000-2339	44	O	C	A
115	"	SFO-HNL	7/22/78	0441-0856	52	O	C	A
116	"	HNL-GUM	7/22/78	1134-1759	127	O	C	A
117	"	GUM-OKA	7/22/78	2056-2312	59	O	C	A
118	"	OKA-TPE	7/23/78	0056-0115	4	O		
119	"	TPE-OKA	7/23/78	0346-0413	15	O	C	A
120	"	OKA-GUM	7/23/78	0547-0802	83	O	C	A
121	"	GUM-HNL	7/23/78	1039-1656	154	O	C	A
122	"	HNL-SFO	7/23/78	1958-2343	46	O	C	A
123	"	SFO-LHR	7/24/78	0244-1154	125	O	C	A
124	"	LHR-JFK	7/24/78	1621-2241	76	O	C	A
125	"	JFK-LHR	7/25/78	0209-0719	63	O	C	A
126	"	LHR-IAD	7/25/78	1046-1714	94	O	C	A
127	"	IAD-DTW	7/25/78	1910-1930	5	O		A
128	"	DTW-IAD	7/25/78	2243-2304	36	O		A
129	"	IAD-LHR	7/26/78	0112-0641	80	O	C	A
130	"	LHR-IAD	7/26/78	1107-1745	77	O	C	A
131	"	IAD-DTW	7/26/78	1943-2008	6	O		A
132	"	DTW-IAD	7/26/78	2301-2321	5	O		A
133	"	IAD-LHR	7/27/78	0127-0717	70	O	C	A
134	"	LHR-JFK	7/27/78	1107-1713	123	O	C	A
					8225			

\+ Number of DATA records
M GASP GMT not available for one or more data points
** Constituent measurements: O - Ozone
F - Filter Exposure
C - Carbon Monoxide
P - Particles and/or Clouds
A - Condensation Nuclei

TABLE VII - FLIGHTS ON GASP TAPE VL0020

C) FILE 3 (PANAM-N655PA)

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
1	GP390	JFK-LHR	7/28/78	1504-2028	80	O	C	A	
2	"	LHR-BRU	7/28/78	2221-2226	2				
3	"	BRU-LHR	7/29/78	0804-0809	2				
4	"	LHR-JFK	7/29/78	1058-1716	105	O	C	A	F
5	"	JFK-FCO	7/29/78	2347-0627	80	O	C	A	
6	"	FCO-IST	7/30/78	0930-1055	18	O		A	
7	"	IST-THR	7/30/78	1239-1436	40	O	C	A	
8	"	THR-BOM	7/30/78	1651-1951	38	O	C	A	
9	"	BOM-THR	7/30/78	2148-0043	67	O	C	A	
10	"	THR-IST	7/31/78	0717-0917	25	O	C	A	
11	"	IST-FCO	7/31/78	1103-1228	18	O	C	A	
12	"	FCO-JFK	7/31/78	1552-0022	103	O	C	A	
13	"	JFK-IAH	8/ 1/78	0403-0625	29	O	C	A	F
14	"	IAH-MEX	8/ 1/78	0846-0946	13	O		A	
15	"	MEX-IAH	8/ 1/78	1504-1604	13	O	C	A	
16	"	IAH-JFK	8/ 1/78	1828-2058	31	O	C	A	
17	"	JFK-LHR	8/ 2/78	0100-0620	64	O	C	A	
18	"	LHR-FRA	8/ 2/78	0935-1000	6	O		A	
19	"	FRA-THR	8/ 2/78	1240-1623	64	O	C	A	
20	"	THR-DEL	8/ 2/78	1840-2110	31	O	C	A	
21	"	DEL-HKG	8/ 2/78	2257-0516	93	O	C	A	
22	"	HKG-NRT	8/ 3/78	0734-1044	39	O	C	A	
23	"	NRT-LAX	8/ 3/78	1317-2212	108	O	C	A	
24	"	LAX-HNL	8/ 4/78	0409-0830	52	O	C	A	F
25	"	HNL-NAN	8/ 4/78	1109-1623	63	O	C	A	
26	"	NAN-SYD	8/ 4/78	1823-2138	40	O	C	A	
27	"	SYD-MEL	8/ 5/78	0010-0045	8	O	C	A	
28	"	MEL-SYD	8/ 5/78	0424-0449	6	O		A	
29	"	SYD-NAN	8/ 5/78	0715-1020	37	O	C	A	
30	"	NAN-HNL	8/ 5/78	1210-1725	79	O	C	A	
31	"	HNL-LAX	8/ 5/78	2105-0100	48	O	C	A	
32	"	LAX-HNL	8/ 6/78	0443-0903	53	O	C	A	
33	"	HNL-LAX	8/ 6/78	1956-0001	50	O	C	A	
34	"	LAX-SFO	8/ 7/78	0221-0231	2				F
35	"	SFO-LAX	8/ 7/78	1500-1520	5	O		A	
36	"	LAX-GUA	8/ 7/78	1745-2135	47	O	C	A	
37	"	GUA-PTY	8/ 9/78	1418-1538	17	O	C	A	
38	"	PTY-GIG	8/ 9/78	1804-2352	84	O	C	A	
39	"	GIG-PTY	8/10/78	0332-0910	67	O	C	A	
40	"	PTY-GUA	8/10/78	1301-1416	16	O	C	A	
41	"	GUA-LAX	8/10/78	1658-2040	61	O	C	A	
42	"	LAX-SFO	8/11/78	0015-0035	5	O		A	
43	"	SFO-HNL	8/11/78	0622-1032	51	O	C	A	
44	"	HNL-GUM	8/11/78	1924-0158	95	O	C	A	
45	"	GUM-MNL	8/12/78	0440-0710	31	O	C	A	

TABLE VII - C) VL0020 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
46	GP390	MNL-GUM	8/12/78	1011-1231	29	O		C	A
47	"	GUM-HNL	8/12/78	1524-2122	87	O		C	A
48	"	HNL-SFO	8/13/78	0134-0523	46	O		C	A
49	"	SFO-LAX	8/13/78	1456-1516	5	O		C	A
50	"	LAX-GUA	8/13/78	1745-2125	45	O		C	A
51	"	GUA-CCS	8/13/78	2357-0236	32	O		C	A
52	"	CCS-GIG	8/14/78	0526-0956	74	O		C	A
53	"	GIG-EZE	8/14/78	1225-1425	23	O		C	A
54	"	EZE-GIG	8/14/78	2242-0032	21	O		C	A
55	"	GIG-CCS	8/15/78	0346-0851	58	O		C	A
56	"	CCS-GUA	8/15/78	1200-1430	18	O		C	A
57	"	GUA-LAX	8/15/78	1731-2047	25	O		C	A
58	"	LAX-SFO	8/16/78	0024-0024	1				
59	"	SFO-LHR	8/16/78	0336-1152	99	O		C	A
60	"	LHR-JFK	8/16/78	1621-2241	77	O		C	A
61	"	JFK-FCO	8/17/78	2342-0627	81	O	W	C	A
62	"	FCO-IST	8/18/78	0944-1114	18	O	W	C	A
63	"	IST-THR	8/18/78	1244-1433	22	O	W	C	A
64	"	THR-KHI	8/18/78	1836-2036	24	O	W	C	A
65	"	KHI-THR	8/18/78	2320-0116	24	O	W	C	A
66	"	THR-IST	8/19/78	0405-0633	44	O	W	C	A
67	"	IST-FCO	8/19/78	0822-0957	16	O	W	C	A
68	"	FCO-JFK	8/19/78	1306-2045	91	O	W	C	A
69	"	JFK-GIG	8/20/78	0254-1054	95	O	W	C	A
70	"	GIG-PTY	8/21/78	0331-0926	84	O	W	C	A
71	"	PTY-GUA	8/21/78	1249-1404	16	O	W		A
72	"	GUA-LAX	8/21/78	1854-2229	60	O	W	C	A
73	"	LAX-SFO	8/22/78	0044-0104	5	O	W		A
74	"	SFO-HNL	8/22/78	0535-0940	47	O	W	C	A
75	"	HNL-GUM	8/22/78	1241-1902	75	O	W	C	A
76	"	GUM-OKA	8/22/78	2118-2324	56	O		C	A
77	"	OKA-TPE	8/23/78	0116-0141	6	O		C	A
78	"	TPE-OKA	8/23/78	0406-0436	6	O			A
79	"	OKA-GUM	8/23/78	0609-0823	26	O	W	C	A
80	"	GUM-HNL	8/23/78	1034-1656	91	O	W	C	A
81	"	HNL-SFO	8/23/78	2035-0003	33	O	W	C	A
82	"	SFO-LAX	8/24/78	1454-1515	5	O	W		A
83	"	LAX-GUA	8/24/78	1735-2110	33	O	W	C	A
84	"	GUA-PTY	8/25/78	0102-0217	16	O	W	C	A
85	"	PTY-GIG	8/25/78	0436-1016	66	O	W	C	A
86	"	GIG-JFK	8/26/78	0233-1048	95	O	W	C	A
87	"	JFK-LHR	8/26/78	1438-2014	65	O	W	C	A
88	"	LHR-BRU	8/26/78	2202-2212	3	O			
89	"	BRU-LHR	8/27/78	0752-0802	3		W		
90	"	LHR-JFK	8/27/78	1107-1734	91	O	W	C	A

TABLE VII - C) VL0020 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**			
91	GP390	JFK-FRA	8/27/78	2254-0514	76	O	W	C	A
92	"	FRA-JFK	8/28/78	1131-1828	93	O	W	C	A
93	"	JFK-FRA	8/28/78	2259-0524	75	O	W	C	A
94	"	FRA-JFK	8/29/78	1041-1740	82	O	W	C	A
95	"	JFK-FRA	8/29/78	2239-0432	71	O	W	C	A
96	"	FRA-JFK	8/30/78	1046-1759	116	O	W	C	A
97	"	JFK-FCO	8/30/78	2359-0643	93	O	W	C	A
98	"	FCO-IST	8/31/78	0924-1101	60	O	W	C	A
99	"	IST-THR	8/31/78	1224-1415	22	O	W	C	A
100	"	THR-BOM	8/31/78	1645-1938	35	O	W	C	A
101	"	BOM-THR	8/31/78	2244-0154	39	O	W	C	A
102	"	THR-IST	9/ 1/78	0527-0801	46	O	W	C	A
103	"	IST-FCO	9/ 1/78	0955-1129	20	O	W	C	A
104	"	FCO-JFK	9/ 1/78	1458-2304	97	O	W	C	A
105	"	JFK-FRA	9/ 2/78	0345-0946	81	O	W	C	A
106	"	FRA-JFK	9/ 2/78	1402-2132	90	O	W	C	A
107	"	JFK-FRA	9/ 3/78	0157-0809	71	O	W	C	A
108	"	FRA-JFK	9/ 3/78	1324-2047	88	O	W	C	A
109	"	JFK-IAH	9/ 4/78	2345-0200	28	O	W		A
110	"	IAH-JFK	9/ 5/78	1826-2036	25	O	W	C	A
111	"	JFK-LHR	9/ 5/78	2352-0507	63	O	W	C	A
112	"	LHR-FRA	9/ 6/78	0819-0845	6	O	W	C	
113	"	FRA-THR	9/ 6/78	1159-1553	46	O	W	C	A
114	"	THR-DEL	9/ 6/78	1758-2038	33	O	W	C	A
115	"	DEL-HKG	9/ 6/78	2240-0502	90	O	W	C	A
116	"	HKG-NRT	9/ 7/78	0700-1010	38		W		
117	"	NRT-LAX	9/ 7/78	1232-2043	112		W		
118	"	LAX-HNL	9/ 8/78	0356-0831	52		W		
119	"	HNL-NAN	9/ 8/78	1110-1625	65		W		
120	"	NAN-SYD	9/ 8/78	1908-2238	42		W		
121	"	SYD-MEL	9/ 9/78	0132-0207	8		W		
122	"	MEL-SYD	9/ 9/78	0426-0456	7		W		
123	"	SYD-NAN	9/ 9/78	0806-1109	38	O	W		A
124	"	NAN-HNL	9/ 9/78	1326-1856	63		W		
125	"	HNL-SFO	9/ 9/78	2155-0149	30	O	W	C	A
126	"	SFO-LHR	9/10/78	0550-1415	81	O	W	C	A
127	"	LHR-JFK	9/10/78	1712-0001	127	O	W	C	A
128	"	JFK-IAH	9/13/78	0131-0401	30		W		
129	"	IAH-JFK	9/13/78	1835-2055	28		W		
130	"	JFK-LHR	9/13/78	2357-0512	63		W		
131	"	LHR-FRA	9/14/78	0834-0854	5	O	W		A
132	"	FRA-THR	9/14/78	1106-1449	45	O	W	C	A
133	"	THR-BKK	9/14/78	1710-2258	69	O	W	C	A
134	"	BKK-HKG	9/15/78	0041-0342	34	O	W	C	A F
135	"	HKG-NRT	9/15/78	0545-0851	36	O	W	C	A

TABLE VII - C) VL0020 FILE 3 CONTINUED....

		FLIGHT ROUTE	DEPARTURE DATE	DATA TIME INTVL(GMT)	DATA+	Data**				
136	GP394	NRT-LAX	9/15/78	1107-1936	117	O W	C		A	
137	"	LAX-HNL	9/16/78	0059-0510	65	W				
138	"	LHR-IAD	9/30/78	1250-1935	81	O	C	P	A	F
139	"	IAD-DTW	9/30/78	2133-2203	7	O	C	P	A	
140	"	DTW-IAD	10/ 1/78	0003-0037	23	O		P	A	
141	"	IAD-LHR	10/ 1/78	0228-0813	69	O	C	P	A	
142	"	LHR-JFK	10/ 1/78	1131-1815	76	O	C	P	A	
143	"	JFK-FRA	10/ 1/78	2252-0457	71	O	C	P	A	
144	"	FRA-JFK	10/ 2/78	1101-1836	87	O	C	P	A	
145	"	JFK-FRA	10/ 2/78	2255-0452	71	O	C	P	A	F
146	"	FRA-JFK	10/ 3/78	1259-2019	86	O	C	P	A	
147	"	JFK-FRA	10/ 4/78	0618-1233	35	O	C	P	A	
148	"	FRA-JFK	10/ 4/78	1605-2215	35	O	C	P	A	
149	"	JFK-FRA	10/ 5/78	0202-0809	104	O	C	P	A	
150	"	FRA-JFK	10/ 5/78	1308-2019	96	O	C	P	A	
151	"	JFK-LHR	10/ 6/78	0113-0651	83					
152	"	LHR-IAD	10/ 6/78	1034-1718	98	O	C	P	A	F
153	"	IAD-DTW	10/ 6/78	1914-1944	22	O		P	A	
154	"	DTW-IAD	10/ 6/78	2238-2307	7					
155	"	IAD-LHR	10/ 7/78	0114-0709	66	O	C	P	A	
156	"	LHR-IAD	10/ 7/78	1124-1803	94	O	C	P	A	
157	"	IAD-DTW	10/ 7/78	1951-2021	7	O	C	P	A	
158	"	DTW-IAD	10/ 7/78	2233-2258	6	O	C	P	A	
159	"	IAD-LHR	10/ 8/78	0132-0732	71					
160	"	LHR-SEA	10/ 8/78	1021-1853	100	O	C	P	A	
161	"	SEA-LHR	10/ 9/78	0139-0934	90	O	C	P	A	F
162	"	LHR-SFO	10/ 9/78	1251-2236	117	O	C	P	A	
					8226					

\+ Number of DATA records

** Constituent measurements:
- O - Ozone
- W - Water Vapor
- F - Filter Exposure
- C - Carbon Monoxide
- P - Particles and/or Clouds
- A - Condensation Nuclei

TABLE VIII - OZONE INSTRUMENT SAMPLING CYCLES

Tape	File	Flights	Sampling Time, seconds O3	.033
VL0016	2	90-end	10	10
VL0018	1	all	10	20
	2	1-33	10	20
	2	34-end	10	10
VL0020	2	83-end	10	--
	3	all	10	--

TABLE IX - SELECTED RECALIBRATION RESULTS

a) - OZONE 'L' TAG DETAILS

A/C	Inst ID	Meas	Dates	Recal	Tape	File	Flights
N533PA	22	Cabin	6/ 1/78- 9/29/78	25% low	VL0015	3	50-end
					VL0016	1	all
					VL0016	2	1-89
N4711U	2	Ambient	6/23/78- 9/20/78	13% low	VL0018	1	all
					VL0018	2	1-32
N4711U	23	Cabin	9/20/78-12/15/78	8% low	VL0018	2	33-end

b) - HYGROMETER CALIBRATION SHIFT DETAILS

A/C	Inst ID	Dates	Cal Shift (on) (off)	Tape	File	Flights
N4711U	104	1/ 8/78- 4/11/78	0 to +2.3 deg C	VL0017	1	all
					2	1-33
N4711U	104	6/23/78-10/ 6/78	+2.3 to -2.2 deg C	VL0018	1	all
					2	all

TABLE X - FILTER DATA ON TAPE VL0017

Exposure Data				
Filter no.	303-2	303-3	303-4	303-5
File,Flight	1,3	1,9	1,18	1,27
Route	SFO-HNL	SFO-LAX	ORD-JFK	HNL-LAX
Date	1/6/78	1/9/78	1/15/78	1/18/78
Time,GMT	2247-0006	1758-1819	0207-0254	0127-0217
Latitude, deg	37-33N	37-35N	42-41N	22-25N
Longitude, deg	125-136W	122-119W	85-76W	155-148W
Altitude, km	9.8-11.1	9.7-9.6	9.8-9.6	9.7-12.2
Region **	T	T	S	T
Constituent Data				
$SO_4^=$, ug/m^3	.003	.040	.033	.019
NO_3^- "	.000	.171	.055	.000
CL^-,	.004	.017	.006	.008
F^-, "	.000	.032	.005	.004
^7Be, pCi/m^3	≤.24	1.857	1.052	≤.30

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONTINUED

Exposure Data				
Filter no.	303-6	303-8	801-8	701-2
File,Flight	1,32	1,38	1,90	1,125
Route	LAX-ORD	HNL-SFO	JFK-SFO	SFO-HNL
Date	1/21/78	1/24/78	2/17/78	3/7/78
Time,GMT	1616-1810	0230-0430	1549-1749	0400-0600
Latitude, deg	35-40N	23-31N	42-43N	37-32N
Longitude, deg	117-98W	156-141W	76-95W	125-140W
Altitude, km	9.8-11.3	10.2-11.8	10.2-11.9	9.8-11.1
Region **	S	M	S	T
Constituent Data				
$SO_4^=$, ug/m^3	.036	.021	.059	.007
NO_3^-, "	.061	.041	.072	.009
CL^-, "	.001	.001		.000
F^-, "	.003	.000		
^7Be, pCi/m^3	1.166	.305	1.316	≤.10

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONTINUED

Exposure Data				
Filter no.	701-3	701-4	701-6	701-8
File,Flight	1,133	1,138	1,150	1,159
Route	SFO-HNL	HNL-SFO	ITO-LAX	ORD-HNL
Date	3/10/78	3/12/78	3/16/78	3/20/78
Time,GMT	0206-0301	0105-0145	0243-0433	0302-0333
Latitude, deg	37-35N	23-27N	22-29N	25-22N
Longitude	125-133W	157-152W	153-136W	155-157W
Altitude, km	9.7-11.0	9.7-11.3	9.7-11.3	11.9-9.5
Region **	T	T	T	T
Constituent Data				
$SO_4^=$, ug/m^3	.012	.024	.010	.014
NO_3^-, "	.031	.040	.012	.029
CL^-, "	.005	.011	.010	.006
F^-, "				
^7Be, pCi/m^3	.309	≤.17	.221	≤.20

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONTINUED

Exposure Data				
Filter no.	304-2	304-3	304-4	304-5
File,Flight	2,53	2,56	2,58	2,63
Route	JFK-LAX	SFO-HNL	SFO-JFK	HNL-SFO
Date	4/18/78	4/21/78	4/23/78	4/25/78
Time,GMT	1825-2025	2251-0051	2041-2241	2018-2208
Latitude, deg	41-38N	37-31N	38-42N	23-31N
Longitude, deg	85-104W	125-141W	120-97W	155-140W
Altitude, km	9.7-11.9	9.7-11.1	9.7-11.3	9.7-11.3
Region **	S	T	M	T
Constituent Data				
$SO_4^=$, ug/m^3	.0661	.022	.044	.011
NO_3^-, "	.149	.033	.098	.053
CL^-, "				
F^-, "				
^7Be, pCi/m^3	1.387	≤.07	.625	≤.08

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONTINUED

Exposure Data				
Filter no.	304-6	304-8	702-2	702-4
File,Flight	2,67	2,69	3,24	3,35
Route	SFO-HNL	LAX-DEN	ITO-LAX	SFO-ORD
Date	4/27/78	4/29/78	5/18/78	5/24/78
Time,GMT	2249-0034	0026-0121	0145-0345	1752-1942
Latitude, deg	37-32N	34-38N	21-28N	38-42N
Longitude, deg	125-139W	116-107W	152-134W	119-99W
Altitude, km	9.8-11.0	10.3-10.7	9.7-11.6	9.7-11.3
Region **	T	T	T	S
Constituent Data				
$SO_4^=$, ug/m^3	.035	.036	.019	.051
NO_3^-, "	.058	.122	.035	.076
CL^-, "				
F^-, "				
^7Be, pCi/m^3	≤.08	.585	.155	1.346

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONTINUED

Exposure Data				
Filter no.	702-5	702-8	305-2	305-3
File,Flight	3,40	3,47	3,70	3,77
Route	SFO-JFK	HNL-SFO	ITO-LAX	JFK-LAX
Date	5/27/78	5/30/78	6/8/78	6/11/78
Time,GMT	1941-2142	1003-1203	0220-0421	0220-0420
Latitude, deg	38-42N	23-31N	22-29N	40-39N
Longitude, deg	119-98W	155-139W	153-135W	77-97W
Altitude, km	9.7-11.3	10.3-11.3	10.1-11.3	9.7-11.9
Region **	M	T	T	T
Constituent Data				
$SO_4^=$, ug/m^3	.050	.036	.013	.011
NO_3^-, "	.059	.031	.011	.012
CL^-, "				
F^-, "				
^7Be, pCi/m^3	.648	.121	≤.04	.174

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE X - FILTER DATA ON TAPE VL0017, CONCLUDED

Exposure Data			
Filter no.	305-4	305-5	305-8
File,Flight	3,85	3,92	3,99
Route	JFK-SFO	SFO-HNL	JFK-ORD
Date	6/14/78	6/17/78	6/20/78
Time,GMT	1426-1627	0312-0412	1540-1621
Latitude, deg	41-41N	38-35N	41-41N
Longitude, deg	79-96W	125-134W	77-84W
Altitude, km	9.8-11.9	9.7-10.7	10.6-9.6
Region **	T	S	T
Constituent Data			
$SO_4^=$, ug/m^3	.046	.089	.021
NO_3^-, "	.087	.128	.087
CL^-, "			
F^-, "			
^7Be, pCi/m^3	.171	1.225	$\leq$.25

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XI - FILTER DATA ON TAPE VL0018

Exposure Data				
Filter no.	902-2	902-3	902-4	104-2
File,Flight	1,122	2,5	2,13	2,33
Route	SFO-JFK	JFK-SFO	ORD-JFK	SFO-ORD
Date	8/10/78	8/13/78	8/16/78	9/21/78
Time,GMT	2144-2244	1424-1625	0351-0436	2104-2304
Latitude, deg	39-42N	41-41N	42-41N	39-42N
Longitude, deg	115-104W	78-100W	85-77W	118-95W
Altitude, km	11.3-11.4	9.7-11.9	9.8-9.6	10.4-10.7
Region **	T	T	T	T
Constituent Data				
$SO_4^=$, ug/m^3	.017	.028	.000	
NO_3^-, "	.051	.024	.057	
CL^-, "		.000	.000	
F^-, "		.000	.000	
^7Be, pCi/m^3	≤.08	.310	.250	.192

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XI - FILTER DATA ON TAPE VL0018, CONTINUED

Exposure Data			
Filter no.	104-4	104-6	704-3
File,Flight	2,47	2,62	2,70
Route	HNL-SFO	HNL-SFO	HNL-SFO
Date	9/27/78	10/3/78	10/6/78
Time,GMT	0212-0411	2010-2125	2037-2238
Latitude, deg	22-29N	22-28N	24-32N
Longitude, deg	153-135W	155-146W	152-137W
Altitude, km	9.7-11.3	9.7-11.3	11.3-11.3
Region **	T	T	T
Constituent Data			
$SO_4^=$, ug/m^3	.004	.014	.003
NO_3^-, "	.010	.035	.011
CL^-, "			.000
F^-, "			
^7Be, pCi/m^3	≤.04	.140	≤.08

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XI - FILTER DATA ON TAPE VL0018, CONCLUDED

Exposure Data		
Filter no.	704-4	704-5
File,Flight	2,70	2,70
Route	HNL-SFO	HNL-SFO
Date	10/6/78	10/6/78
Time,GMT	2240-2339	2341-2359
Latitude, deg	32-35N	35-36N
Loggitude, deg	137-127W	127-124W
Altitude, km	11.3-11.3	11.3-11.1
Region **	T	T
Constituent Data		
$SO_4^=$, ug/m^3	.015	.000
NO_3^-, "	.016	.023
CL^-, "		
F^- "		
^7Be, pCi/m^3	≤.22	≤.69

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XII - FILTER DATA ON TAPE VL0019

Exposure Data				
Filter no.	502-5	101-8	901-3	901-8
File,Flight	2,1	2,5	3,18	3,23
Route	SFO-HNL	GUA-SJO	LHR-JFK	SFO-LAX
Date	1/9/78	1/15/78	3/16/78	3/19/78
Time,GMT	2345-0145	0054-0123	1221-1422	1620-1633
Latitude, deg	51-55N	13-11N	54-56N	36-35N
Longitude, deg	141-168W	89-86W	4-30W	121-119W
Altitude, km	9.7-10.1	9.7-10.1	9.7-10.4	10.0-9.6
Region **	S	T	M	T
Constituent Data				
$SO_4^=$, ug/m^3	.080	.015		.192
NO_3^-, "	.051	.039		.185
CL^-, "	.001			
F^-, "	.004			
^7Be, pCi/m^3	2.396		1.765	≤.48

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XIII - FILTER DATA ON TAPE VL0020

Exposure Data				
Filter no.	802-8	103-4	203-2	203-4
File,Flight	1,6	2,8	3,4	3,13
Route	PDX-HNL	HKG-NRT	LHR-JFK	JFK-IAH
Date	5/18/78	6/17/78	7/29/78	8/1/78
Time,GMT	1927-2127	0654-0855	1117-1318	0409-0610
Latitude, deg	36-25N	22-32N	52-53N	40-32N
Longitude, deg	143-156W	117-132E	7-33W	76-92W
Altitude, km	9.8-10.7	9.7-10.1	9.8-10.1	9.7-11.3
Region **	T	T	M	T
Constituent Data				
$SO_4^=$, ug/m^3	.065	.010	.094	.022
NO_3^-, "	.122	.033	.081	.047
CL^-, "				
F^-, "				
^7Be, pCi/m^3	.271	≤.10	1.018	≤.12

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XIII - FILTER DATA ON TAPE VL0020, CONTINUED

Exposure Data				
Filter no.	203-5	203-6	306-1	306-2
File,Flight	3,24	3,34	3,134	3,138
Route	LAX-HNL	LAX-SFO	BKK-HKG	LHR-IAD
Date	8/4/78	8/7/78	9/15/78	9/30/78
Time,GMT	0416-0616	0226-0234	0056-0256	1810-1939
Latitude, deg	34-29N	35-36N	11-16N	44-40N
Longitude, deg	122-140W	121-122W	103-113E	61-75W
Altitude, km	9.7-9.9	9.8-9.5	11.1-15.5	9.8-9.6
Region **	T	T	T	T
Constituent Data				
$SO_4^=$, ug/m^3	.023		.040	.026
NO_3^-, "	.021	.309	.127	.046
CL^-, "				
F^-, "				
^7Be, pCi/m^3	≤.12	≤.20	≤.09	.248

** - T - Troposphere
S - Stratosphere
M - Mixed

TABLE XIII - FILTER DATA ON TAPE VL0020, CONCLUDED

Exposure Data			
Filter no.	306-3	306-6	306-8
File,Flight	3,145	3,152	3,161
Route	JFK-FRA	LHR-IAD	SEA-LHR
Date	10/3/78	10/6/78	10/9/78
Time,GMT	0056-0257	1106-1306	0155-0305
Latitude, deg	51-54N	52-52N	50-58N
Longitude, deg	50-19W	9-35W	120-110W
Altitude, km	10.4-10.4	9.7-9.8	10.0-10.1
Region **	T	T	T
Constituent Data			
$SO_4^=$, ug/m^3	.072	.029	.011
NO_3^-, "	.023	.036	.017
CL^-, "			
F^-, "			
^7Be, pCi/m^3	.112	.419	≤.18

** - T - Troposphere
S - Stratosphere
M - Mixed

APPENDIX A - Specifications for GASP Archive Tapes (VLXXXX)

GENERAL

1. Tapes are written in EBCDIC format using nine track tapes.

2. Tape density is 800 BPI.

3. Physical records (blocks) are 4096 bytes.

4. The tapes are unlabeled, and contain one or more GASP data files. (On tapes < VL0009 these are followed by a tropopause pressure data file.)

GASP DATA FILE

1. Each GASP data file contains data from a single GASP aircraft. Within each file, data are grouped and identified by flights (takeoff to landing) in chronological order.

2. The GASP data for each flight begins with a logical FLHT record (flight identification data), which is followed by logical DATA records (one for each data recording made during the flight). Both FLHT and DATA records contain 512 bytes, hence there are 8 logical records per physical record (block).

3. An FLHT record will always be the first logical record in a block. However, every block need not begin with an FLHT record (i.e., if there are more than seven DATA records in a flight). If the FLHT record plus the available DATA records for a flight do not fill an integer number of blocks, the unused logical records in the final block are padded with zeros creating PADD records. The diagram below shows how several short flights would be blocked.

Block	1								2								3							
	F	D	D	D	D	D	P	P	F	D	D	D	D	D	D	D	D	D	P	P	P	P	P	P
Logical Record	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

Block	4								5								6							
	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	F	D	D	D	D	D	D	P
Logical Record	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

where F is an FLHT record
D is a DATA record
P is a PADD record

4. The first four bytes in each logical record identify the record type as FLHT, DATA, or PADD. Detailed specification of the parameters and formats for FLHT and DATA records are given in Table A-I and A-II respectively.

   a) In each FLHT record, the number of DATA records to follow is given by NDATA (Bytes 78-81), and the number of blocks in the flight is given by NBLOCK (Bytes 82-84).

   b) For the last DATA record of each flight, LBFLG (Byte 5) = 'L'; for the last DATA record in each file, LBFLG = 'G' if the following file is a GASP data file, and LBFLG = 'T' if the following file is the tropopause pressure file; for all other DATA records, LBFLG = ' '.

   Note: DATA records with LBFLG ≠ ' ' will be followed by PADD records if the physical record (block) is not complete.

Table A-I Format for FLHT Records

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
1-4	RECID	A4	RECID = 'FLHT'
5-10	TAPID	6A1	Original GASP tape number, GPXXX
11-25	ACID	A15A1	Aircraft ID; Airline and tail number
26-28	APTLV	3A1	Airport of departure (3 letter code)
29-34	DATLV	3I2	Date first DATA record this flight; Mo=29-30,Da=31-32,Yr=33-34
35-38	TIMLV	2A2	Time (GMT) first DATA record this flight; Hr=35-36,Min=37-38
39-43	LATLV	F5.2	Latitude (deg) of APTLV
44	LALVT	A1	Hemisphere of LATLV; 'N' or 'S'
45-50	LONLV	F6.2	Longitude (deg) of APTLV
51	LOLVT	A1	Hemisphere of LONLV; 'E' or 'W'
52-54	APTAR	3A1	Airport of arrival (3 letter code)
55-60	DATAR	3I2	Date last DATA record this flight; Mo=55-56,Da=57-58,Yr=59-60
61-64	TIMAR	A4	Time (GMT) last DATA record this flight; Hr=61-62,Min=63-64
65-69	LATAR	F5.2	Latitude (deg) of APTAR
70	LAART	A1	Hemisphere of LATAR, 'N' or 'S'
71-76	LONAR	F6.2	Longitude (deg) of APTAR
77	LOART	A1	Hemisphere of LONAR, 'E' or 'W'
78-81	NDATA	I4	Number of DATA records for this flight - see OVRFLO, byte 508
82-84	NBLOCK	I3	Total number of blocks for this flight - see OVRFLO, byte 508
85-87	O3ID	3A1	Ambient ozone instrument ID number*
88-90	COID	3A1	Carbon monoxide instrument ID number*
91-93	PCSID	3A1	Particle counter sensor ID number*
94-96	PCEID	3A1	Particle counter electronics ID number*
97-99	H2OID	3A1	Water vapor sensor ID number*
100-102	HYGID	3A1	Hygrometer ID number*
103-105	CNID	3A1	Condensation nuclei instrument ID number*
106-108	O33ID	3A1	Cabin ozone instrument ID number*
109-117		9A1	Spares

Table A-I Continued

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
118-122	D1	F5.3	Smallest particle radius (micrometers) for PC range 1
123-127	D2	F5.3	Smallest particle radius (micrometers) for PC range 2
128-132	D3	F5.3	Smallest particle radius (micrometers) for PC range 3
133-137	D4	F5.3	Smallest particle radius (micrometers) for PC range 4
138-142	D5	F5.3	Smallest particle radius (micrometers) for PC range 5
143	LIMCHK	A1	LIMCHK='T' if acceleration limit exceeded (NE>0) on any DATA record this flight; otherwise LIMCHK='F'
144	FILEX	A1	FILEX='T' if filter exposed this flight; otherwise FILEX='F'
145	FDATA	A1	FDATA='T' if filter data on tape; otherwise FDATA='F'
146-149	FPAKN	I4	Filter pack number
150-151	FILTN	I2	Filter number
152-161	FTYPE	10A1	Filter type
162-167	FDATON	3I2	Filter exposure start date; Mo=162-163,Da=164-165,Yr=166-167
168-171	FTIMON	A4	Filter exposure start time; (GMT); Hr=168-169,Min 170-171
172-176	FLATON	F5.2	Filter exposure start latitude (deg)
177	FLAONT	A1	Filter exposure start latitude tag; 'N' or 'S'
178-183	FLONON	F6.2	Filter exposure start longitude (deg)
184	FLOONT	A1	Filter exposure start longitude tag; 'E' or 'W'
185-190	FHTMON	F6.0	Filter exposure start altitude (meters)
191-196	FDATOF	3I2	Filter exposure stop date; Mo=191-192,Da=193-194,Yr=195-196
197-200	FTIMOF	A4	Filter exposure stop time (GMT); Hr=197-198,Min=199-200
201-205	FLATOF	F5.2	Filter exposure stop latitude (deg)
206	FLAOFT	A1	Filter exposure stop latitude tag; 'N' or 'S'
207-212	FLONOF	F6.2	Filter exposure stop longitude (deg)
213	FLOOFT	A1	Filter exposure stop longitude tag; 'E' or 'W'
214-219	FHTMOF	F6.0	Filter exposure stop altitude (meters)

Table A-I Continued

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
220-229	FCOMP1	10A1	Filter constituent 1 (name)
230-239	FCOMP2	10A1	Filter constituent 2 "
240-249	FCOMP3	10A1	Filter constituent 3 "
250-259	FCOMP4	10A1	Filter constituent 4 "
260-269	FCOMP5	10A1	Filter constituent 5 "
270-279	FDC1	F10.3	Data for constituent 1 (micrograms/m**3)
280-289	FDC2	F10.3	Data for constituent 2 (micrograms/m**3)
290-299	FDC3	F10.3	Data for constituent 3 (micrograms/m**3)
300-309	FDC4	F10.3	Data for constituent 4 (micrograms/m**3)
310-319	FDC5	F10.3	Data for constituent 5 (picoCuries/m**3)
320	SBUEX	A1	SBUEX='T' if MODE=10 recording this flight; otherwise SBUEX='F'
321		A1	Spares**
322-324		I3	Spares**
325-332		4I2	Spares**
333-336		A4	Spares**
337-341		F5.2	Spares**
342		A1	Spares**
343-348		F6.2	Spares**
349		A1	Spares**
350-355		F6.0	Spares**
356-361		3I2	Spares**
362-365		A4	Spares**
366-370		F5.2	Spares**
371		A1	Spares**
372-377		F6.2	Spares**
378		A1	Spares**

Table A-I Completed

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
379-384		F6.0	Spares**
385-434		50A1	Spares**
435-444	FFLO	F10.1	Filter flow in ambient cubic meters**
445-484		4F10.1	Spares**
485-489	a	F5.3	O3 destruction constant (see eq. 1)
490-494	b	F5.3	O3 destruction constant (see eq. 1)
495-499	c	F5.1	O3 destruction constant (see eq. 1)
500-507	d	E8.2	O3 destruction constant (see eq. 1)
508	OVRFLO	I1	If OVRFLO>0, NDATA=NDATA+OVRFLO*7992, and NBLOCK=NBLOCK+OVRFLO*1000
509-512	SENS	F4.2	Carbon monoxide sensitivity correction factor

* If ID='M', no data for this instrument this flight

** Used on tapes VL0004, VL0005, and VL0006 for reporting data from "grab" sample bottle exposures - see TM X-73574, TM X-73608, and TM 73727

\+ If more than one filter was exposed during a flight, the data in the FLHT record are for the first one. Other exposures are identified in the text.

Table A-II Format for DATA Records

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
1-4	RECID	A4	RECID= 'DATA'
5	LBFLG	A1	LBFLG='L' if this is the last data record this flight; LBFLG='G' if this is the last GASP data record in the file and the following file is a GASP data file or this is the last file on the tape; LBFLG='T' if this is the last GASP data record in the file and the following file is a tropopause pressure file; otherwise LBFLG=' '
6-9	RECORD	I4	Record number on TAPID (see table A-I)*
10	FRAME	I1	Frame number on TAPID (see table A-I)*
11-12	MODE	I2	Program mode*: = 4 - normal recordings = 10 and 12 - continuous recordings
13	TYPE	A1	Record type*: = 'N' for normal recordings = 'L' for continuous limit recordings = 'C' for continuous recordings ±±
14	CYCLE	A1	Calibration cycle number, or CYCLE='D' for data; cal and data cycles alternate at 5 min intervals, unless MODE = 10 or 12 or TYPE = 'L'
15-20	DATE	3I2	Mo=15-16, Da=17-18, Yr=19-20
21-24	TIME	A4	Time (GMT), Hr=21-22, Min=23-24; see GMTTAG, byte 395
25-30	ALTFAV	F6.0	Pressure altitude (ft)
31-36	ALTMAV	F6.0	Pressure altitude (meters) - see ALTAG, byte 44
37-43	PAMB	F7.2	Ambient static pressure in hPa - calc from ALTFAV
44	ALTAG	A1	ALTAG='C', 'D', or 'G' indicates climb, descent, or ground If ALTAG='T', ALTMAV and TRPRHM are geopotential heights (m)
45-49	LAT	F5.2	Latitude (deg)
50	LATAG	A1	Latitude hemisphere, 'N' or 'S'
51-56	LONG	F6.2	Longitude (deg)
57	LONGTAG	A1	Longitude hemisphere, 'E' or 'W'

Table A-II Continued

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
58-62	XI	F5.2	Aircraft position in NMC 65x65 grid coordinates (N. Hem only)
63-67	YJ	F5.2	Aircraft position in NMC 65x65 grid coordinates (N. Hem only)
68-71	HEADG	F4.0	Aircraft heading (deg)
72	HEADGT	A1	Tag for HEADG**
73-76	TASK	F4.0	True airspeed (knots)
77-81	XMATAS	F5.3	Flight mach number
82	TATAG	A1	Tag for TASK and XMATAS**
83-86	WS	F4.0	Wind speed (knots)
87-90	WSM	F4.0	Wind speed (meters/sec)
91	WSTAG	A1	Tag for WS and WSM**
92-95	WDEG	F4.0	Wind direction (deg)
96	WDEGTG	A1	Tag for WDEG**
97-100	SAT	F4.0	Static (ambient) air temperature (deg C)
101	SATAG	A1	Tag for SAT**
102-229	ACC(I)	32F4.2	Vertical acceleration (G's); 32 values each record at 8/sec
230-233	ACCMAX	F4.2	Max of ACC(I)
234-237	ACCMIN	F4.2	Min of ACC(I)
238-239	NE	I2	Number of times ACC(I) > 1.2 or ACC(I) < 0.8
240	ACCTAG	A1	Tag for ACC(I), ACCMAX, ACCMIN, NE**
241-245	ZEN	F5.1	Solar elevation angle (deg); 0 deg = horizontal
246	SUNTAG	A1	SUNTAG='N' if sun below horizon**
247-252	O3	F6.0	Ozone data (ppbv)
253	O3TAG	A1	Tag for O3** If O3TAG='Z', O3 = instrument zero (ppbv) - see text
254-259	O3A	F6.0	Ozone ave (ppbv); for 128 sec preceding recording
260	O3ATAG	A1	Tag for O3A**
261-266	O3S	F6.0	Ozone std deviation (ppbv); for 128 sec preceding recording
267	O3STAG	A1	Tag for O3S**

Table A-II Continued

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
268-273	DFPTA	F6.1	Dew/frost point temperature (deg C) #
274-279	WVMRA	F6.1	Water vapor mixing ratio (ppmw) #
280	DFTAGA	A1	Tag for DFPTA and WVMRA; if DFPTA ≥ SAT, DFTAGA='S'**
281-286	COAVG	F6.0	Carbon monoxide data (ppbv)
287	COTAGA	A1	Tag for COAVG** If COTAGA='Z', or 'C' COAVG = instrument zero (mv) - see text If COTAGA='G', COAVG = instrument gain (mv) - see text If COTAGA='F', COAVE = full scale data reading - see text
288-293	COA	F6.0	Carbon monoxide ave (ppbv); for 128 sec preceding recording
294	COATAG	A1	Tag for COA**
295-300	COSD	F6.0	Carbon monoxide std deviation (ppbv); for 128 sec preceding recording
301	COSTAG	A1	Tag for COSD**
302-311	PD1	1PE10.3	Particle density for particles > D1 (particles/m**3)
312	PDTAG1	A1	Tag for PD1**
313-322	PD2	1PE10.3	Particle density for particles > D2 (particles/m**3)
323	PDTAG2	A1	Tag for PD2**
324-333	PD3	1PE10.3	Particle density for particles > D3 (particles/m**3)
334	PDTAG3	A1	Tag for PD3**
335-344	PD4	1PE10.3	Particle density for particles > D4 (particles/m**3)
345	PDTAG4	A1	Tag for PD4**
346-355	PD5	1PE10.3	Particle density for particles > D5 (particles/m**3)
356	PDTAG5	A1	Tag for PD5**
357-361	CLSEC	F5.0	Time in clouds (sec) during 255 sec preceding recording
362-365	CLAYR	F4.0	Number of cycles in and out of clouds (layers) during 255 sec preceding recording
366	CLTAG	A1	Tag for CLSEC and CLAYR; if CLSEC > 0, CLTAG='C'**
367-373	TRPRMB	F7.2	Tropopause pressure in hPa (mb); time and space interpolated from NMC data fields+

Table A-II Continued

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
374	TPTAG	A1	Tag for tropopause data+ If TPTAG=' ', TRPRMB from 12 hour interpolation If TPTAG='L', TRPRMB from 24 hour interpolation If TPTAG='E', TRPRMB from nearest NMC reporting period If TPTAG='T', TRPRMB from 1200 GMT reporting period ± If TPTAG='M', data not available
375-381	DELP	F7.2	DELP = TRPRMB - PAMB, in hPa (mb)+
382-387	TRPRHM	F6.0	Tropopause height in meters+ If ALTAG≠'T', TRPRHM from TRPRMB assuming std. atm. If ALTAG='T', TRPRHM interpolated from NMC data fields
388-394	DELHGT	F7.0	DELHGT = ALTFAV*.3048 - TRPRHM, in meters, where TRPRHM from TRPRMB assuming std. atm.+
395	GMTTAG	A1	Tag for TIME** ++
396-401	CNC	F6.0	Condensation nuclei data; number/cc
402	CNTAG	A1	Tag for CNC** If CNTAG='Z', CNC = instrument zero (mv) - see text If CNTAG='P', CNC = full scale data reading - see text
403-408	AVA	F6.0	Condensation nuclei data; number/cc - average over 240 sec prior to recording - see text
409	AVATAG	A1	Tag for AVA**
410-415	ATKMAX	F6.0	Max condensation nuclei (number/cc) during 240 sec period for AVA - see text
416	AMXTAG	A1	Tag for ATKMAX**
417-422	ATKMIN	F6.0	Min condensation nuclei (number/cc) during 240 sec period for AVA - see text
423	AMNTAG	A1	Tag for ATKMIN**
424-428	RHOR	F5.3	Density ratio correction used in processing O3 and CO data - see text

Table A-II Completed

Bytes	Fortran Name	Fortran Format	Parameter Description, Units, and Comments
429-433	DENS	F5.3	Density ratio correction used in processing CN data - see text
434-440	O33	F7.0	Inside (Cabin) ozone; ppbv
441	O33TAG	A1	Tag for O33
442-446	CDENS	F5.3	Density ratio correction used in processing O33 data - see text
447-452	RPFLOM	F6.2	Conversion from particle counts to particle density
453-456	BLDGND	I4	15th stage bleed indicator--VL0010 only
457-460	BLDFLT	I4	15th stage bleed indicator--VL0010 only
461-466		F6.0	Spares
467		A1	Spare
468-512		45A1	Spares

---

* Each recording period is 16 sec in duration with 4 frames/record; only 1 frame from each recording period is reported unless MODE = 10 or TYPE = 'L' or 'C'.

** If TAG='M', corresponding data field will be zero; the 'M' tag is used whenever data are not available, have been edited out, or an instrument is in a calibration cycle which is not used directly in the data processing.

\+ Added beginning with VL0004 to provide time and space interpolated tropopause data

++ Added beginning with VL0006 to identify records for which GMT is not available

± Added beginning with VL0007 to identify tropopause data obtained from 1200 GMT arrays when GASP GMT is not available

±± Added beginning with VL0009 to identify continuous recordings with normal cal/data cycling - see CYCLE, byte 14.

\# Water vapor instrument changed to chilled-mirror type beginning with VL0014 - see text

APPENDIX B - AIRPORT/CITY CODES

AKL - Auckland, New Zealand
AMS - Amsterdam, Netherlands
ATH - Athens, Greece
BAH - Bahrain Is., Arabian Gulf
BKK - Bangkok, Thailand
BNE - Brisbane, Australia
BOM - Bombay, India
BOS - Boston, Mass.
BRU - Brussels, Belgium
CCS - Caracas, Venezuela
CHC - Christchurch, New Zealand
CTS - Sapporo, Japan
DEL - Delhi, India
DEN - Denver, Colorado
DRW - Darwin, Australia
DTW - Detroit, Michigan
DUB - Dublin, Ireland
EZE - Buenos Aires, Argentina
FAI - Fairbanks, Alaska
FCO - Rome, Italy
FRA - Frankfurt, Germany
GIG - Rio de Janeiro, Brazil
GUM - Guam Island, Mariana Islands
HKG - Hong Kong, Hong Kong
HND - Tokyo, Japan
HNL - Honolulu, Hawaii
IAD - Washington, D. C.
ITO - Hilo, Hawaii
JFK - New York, New York
KHI - Karachi, Pakinstan
LAS - Las Vegas, Nevada
LAX - Los Angeles, California
LHR - London, England
MEL - Melbourne, Australia
MEX - Mexico City, Mexico
MNL - Manila, Philippines
NAN - Nandi, Fiji Island
NOU - Noumea, New Caledonia
NRT - Tokyo, Japan
OKA - Okinawa, Japan
ORD - Chicago, Illinois
PDX - Portland, Oregon
PIK - Glasgow, Scotland
PPG - Pago Pago, Samoa
PPT - Papeete, Tahiti
PTY - Panama City, Panama
SEA - Seattle, Washington
SFO - San Francisco, California
SIN - Singapore, Singapore
STL - St. Louis, Missouri
STR - Stuttgart, Germany
SYD - Sydney, Australia
THR - Tehran, Iran
TPE - Taipei, Taiwan
VCP - Sao Paulo, Brazil
YVR - Vancouver, B. C., Canada
YYZ - Toronto, Ontario, Canada

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15. Supplementary Notes

16. Abstract

This report is the twelfth of a series of reports which describes the data currently available from GASP, including flight routes and dates, instrumentation, data processing procedures, and data tape specifications. In-situ measurements of atmospheric ozone, cabin ozone, carbon monoxide, water vapor, particles, clouds, condensation nuclei, filter samples and related meteorological and flight information obtained during 1732 flights of aircraft N533PA, N4711U, N655PA, and VH-EBE from January 5, 1978 through October 9, 1978 are reported. These data are now available from the National Climatic Center, Asheville, NC, 22801. In addition to the GASP data, tropopause pressures obtained from time and space interpolation of National Meteorological Center (NMC) archived data for the dates of the flights are included.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
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