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Airborne Measurements of Atmospheric Volume Scattering Coefficients in Northern Europe, Summer 1978

Richard W. Johnson
Jacqueline I. Gordon

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UNIVERSITY OF CALIFORNIA SAN DIEGO

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This report presents daytime atmospheric optical data collected chiefly with airborne instruments during a field expedition to northern Europe in the Summer of 1978. Results from 19 flights are presented. The data include the natural irradiance upon horizontal plane surfaces, total volume scattering coefficients, and derived values of atmospheric radiance transmittance and equivalent attenuation length. Data for daytime conditions ranging from relatively clear

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and cloud free to completely overcast are presented. Data were measured in four spectral regions, as follows: Three narrow band optical filters with mean wavelengths of 478, 664, and 765 nanometers; and one broad band sensitivity representing a pseudo-photopic response with a mean wavelength of 557 nanometers.

Selected meteorological properties, measured concurrently with the radiometric data are also included.

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AIRBORNE MEASUREMENTS OF ATMOSPHERIC VOLUME SCATTERING COEFFICIENTS IN NORTHERN EUROPE, SUMMER, 1978

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SUMMARY

This report, which describes portions of the Visibility Laboratory's Project OPAQUE V* effort, was prepared under AFGL Contract F19628-78-C-0200. The principal project task was to take daytime atmospheric optical measurements in northern Europe and, from these measurements, to determine optical properties for various upward- and downward-inclined paths of sight. These properties include the natural irradiance upon horizontal plane surfaces, scalar irradiances, total volume scattering coefficients, atmospheric radiance (beam) transmittances, path radiances, directional path reflectances, and directional sky and terrain reflectances. This report does not contain all of these optical properties, but in an effort to accelerate the availability of selected values, the data have been restricted to total volume scattering coefficients, atmospheric radiance (beam) transmittances, and natural irradiances upon horizontal plane surfaces. The data base for the derivation of the additional, more directional optical properties is available on tape and can be exploited upon demand. Selected meteorological properties measured concurrently with the radiometric data are also included.

The OPAQUE V field trip was made to northern Europe during August and September 1978. Data were recorded in six geographical regions - namely, off the western coast of Sicily, over northern and southern Germany, over southern England, in the Netherlands, and off the coast of southern Denmark. The daytime flight conditions for the 19 flights reported herein ranged from reasonably cloud free with moderate haze to heavy broken clouds and full overcast.

The airborne radiometric instrumentation, developed at the Visibility Laboratory and mounted in Air Force C-130A Aircraft No. 50022, consisted of a total scattering meter (or integrating nephelometer) for determining the total volume scattering coefficient, two scanning radiometers for measuring upper and lower hemisphere (sky and terrain) radiances, a dual irradiometer for measuring alternately the downwelling and upwelling irradiances, an equilibrium radiance telephotometer, and a variable direction path function meter. The meteorological instrumentation included an absolute pressure transducer, a dewpoint hygrometer, and an AN/AMQ-17 aerograph for measuring ambient temperature and pressure.

A Visibility Laboratory ground based data station, equipped with a contrast reduction meter for determining earth-to-space radiance (beam) transmittance and an integrating nephelometer for determining the ground level total volume scattering coefficient, was operational at four data sites. It was located at the Meppen OPAQUE site while the aircraft was operating in northern Germany, at the Birkhof OPAQUE site while the aircraft was in southern Germany, at the Trapani OPAQUE site while the aircraft was in Sicily, and at HMS Heron, Royal Naval Air Station, Yeovilton England while the aircraft was operating out of Mildenhall Air Base.

*The project title OPAQUE V has been assigned to this activity by the Air Force Geophysics Laboratory as a nickname for procedural identification only. It is not necessarily utilized or recognized by agencies or organizations outside of the participating USAF organizations and the Visibility Laboratory. The relationship between this activity and other similar OPAQUE related activities conducted by the Visibility Laboratory is illustrated in AFGL-TR-78-0286, Duntley, *et al.* (1978c).

Each optical instrument was fitted with four optical filters causing it to measure at three narrow wavelength bands of the spectrum and one broad pass band. The measurements were made using three narrow band filters at mean wavelengths of 478, 664, and 765 nanometers and a pseudo-photopic filter with a mean wavelength of 557 nanometers.

All primary data were recorded on magnetic tapes which were returned to the Visibility Laboratory for processing at the computer facilities of the University of California, San Diego.

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1. INTRODUCTION

The field measurement program described in this report was organized under the project title OPAQUE V (Optical Atmospheric Quantities in Europe). It was conducted during August and September 1978, to obtain data for case studies of the summer atmospheric optical properties over northern Europe.

The OPAQUE V deployment was the fifth in a series that is planned to provide atmospheric optical data in several regions of northern Europe. These deployments are organized as a cooperative but independent effort associated with the NATO Research Study Group 8 of Panel IV, AC243. The OPAQUE V deployment plan was specified in Air Force Geophysics Laboratory OPLAN for OPAQUE V dated 5 May 1978.

The Visibility Laboratory, under the sponsorship of the Air Force Geophysics Laboratory, has conducted a continuing program of experimental measurements documenting optical and meteorological properties of the lower atmosphere. These measurements and the computations related to their use are examples of a continuous effort to determine and apply quantitative as well as qualitative values to the atmospheric properties most affecting the performance of visual and/or electro-optical tasks within the troposphere.

The instrumental and computational organization for implementing those techniques related to the documentation of optical atmospheric properties is documented in several preceding reports. A recent example of these reports is AFGL-TR-76-0188, Duntley, *et al.* (1976).

This report, Scientific Report No. 13, has been prepared under Contract No. F19628-78-C-0200. It contains measured profiles of atmospheric volume scattering coefficient and downwelling irradiances between ground level and altitudes up to 6.2 kilometers. Computed values for vertical atmospheric radiance transmittance and equivalent attenuation length are also presented for the same altitude interval. The measurements were made along the flight tracks illustrated in Figs. 1-1a, 1-1b, 1-1c, 1-1d, 1-1e, 1-1f, and 1-1g. Selected meteorological properties measured concurrently with the radiometric data are also included.

The methods used in the derivation and computation of the included optical properties are summarized in Section 2, and are similar to those presented in AFGL-TR-77-0078, Duntley, *et al.* (1977).

The instrumentation, developed at the Visibility Laboratory and installed in Air Force C-130A Aircraft No. 50022, is reported in detail in AFCRL-70-0137, Duntley, *et al.* (1970a), AFCRL-72-0593, Duntley, *et al.* (1972c), AFCRL-TR-75-0457, Duntley, *et al.* (1975b), and AFGL-TR-78-0286, Duntley, *et al.* (1978c). A brief review of the instrumentation as used during the OPAQUE V deployment is presented in Section 3.

Fig 1-1a Typical OPAQUE V Flight Tracks

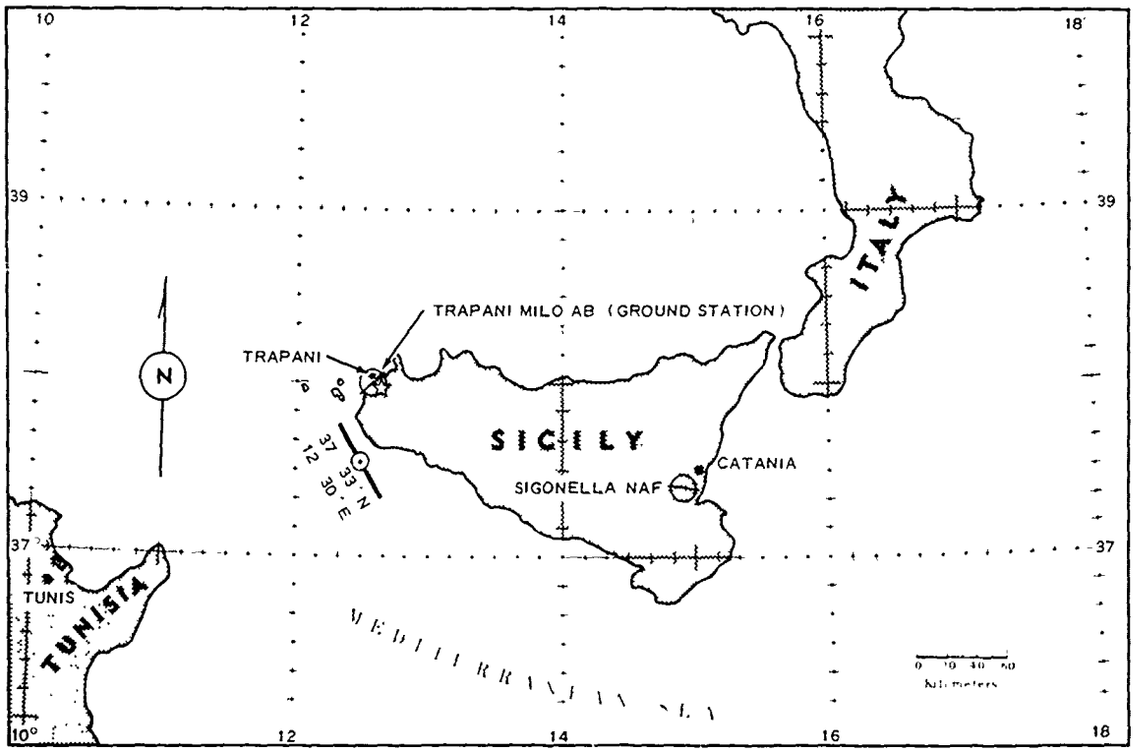


Fig 1-1b Typical Trapani Track and Data Sites, Detail Maps Latitude and Longitude References are to Flight Track Center Point

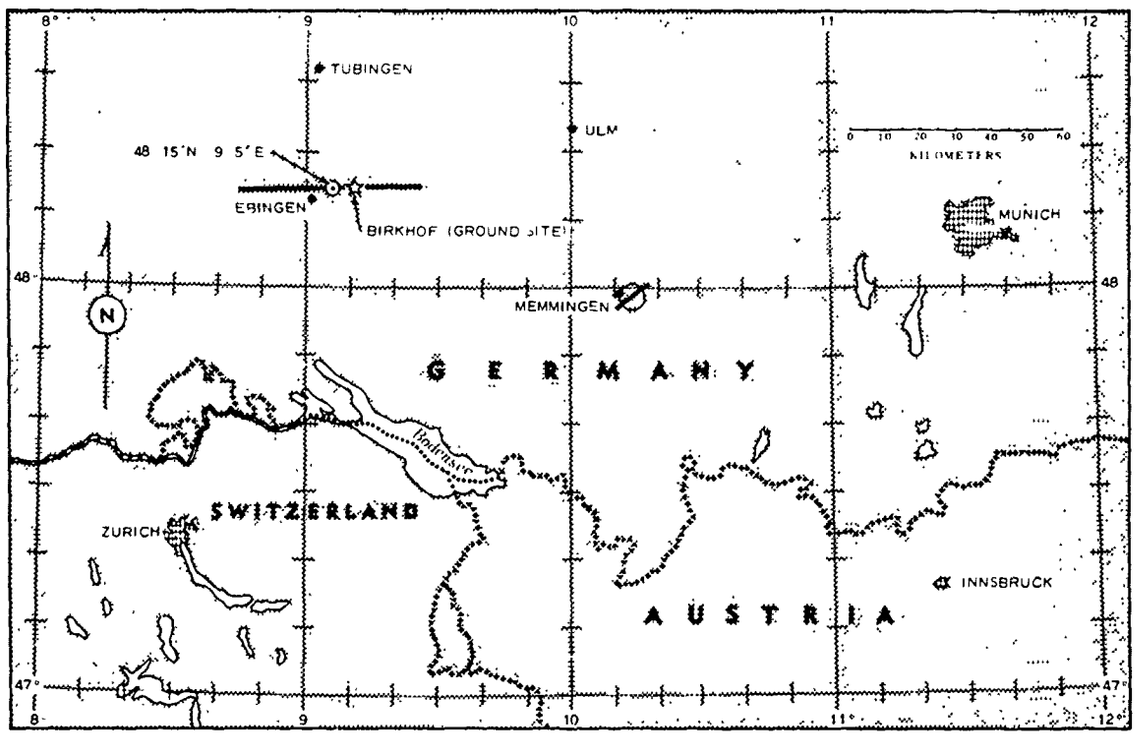


Fig 1-1c Typical Birkhof Track and Data Sites, Detail Maps Latitude and Longitude References are to Flight Track Center Point

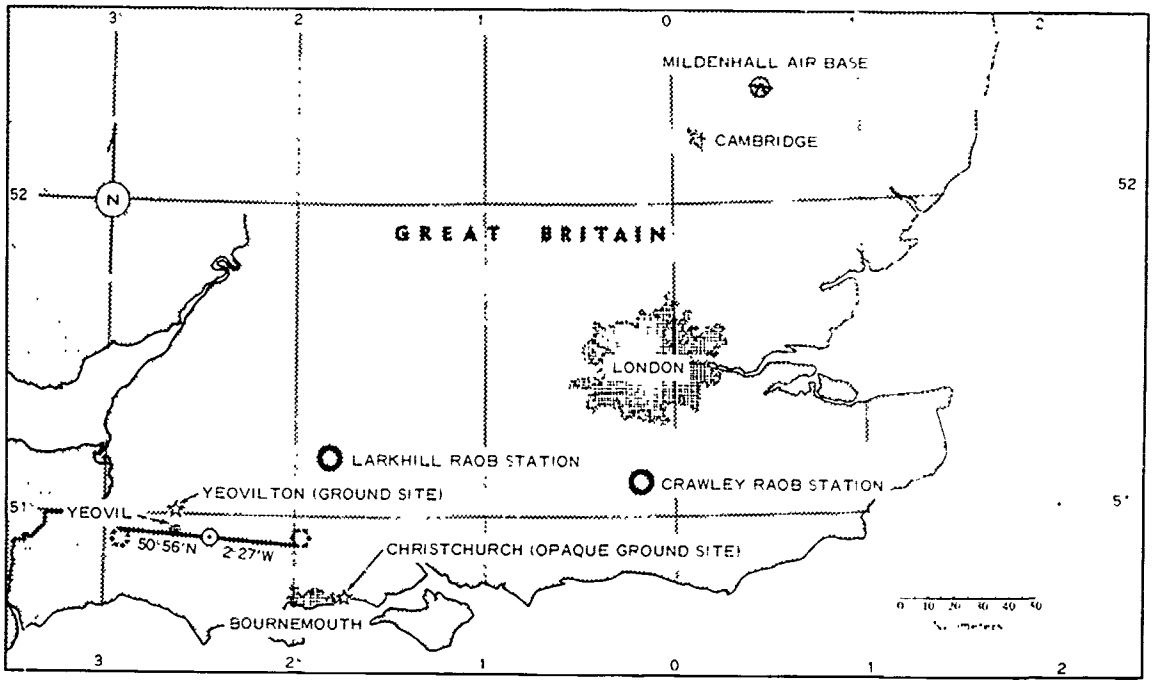


Fig 1-1d Typical Yeovil Track and Data Sites, Detail Maps Latitude and Longitude References are to Flight Track Center Point

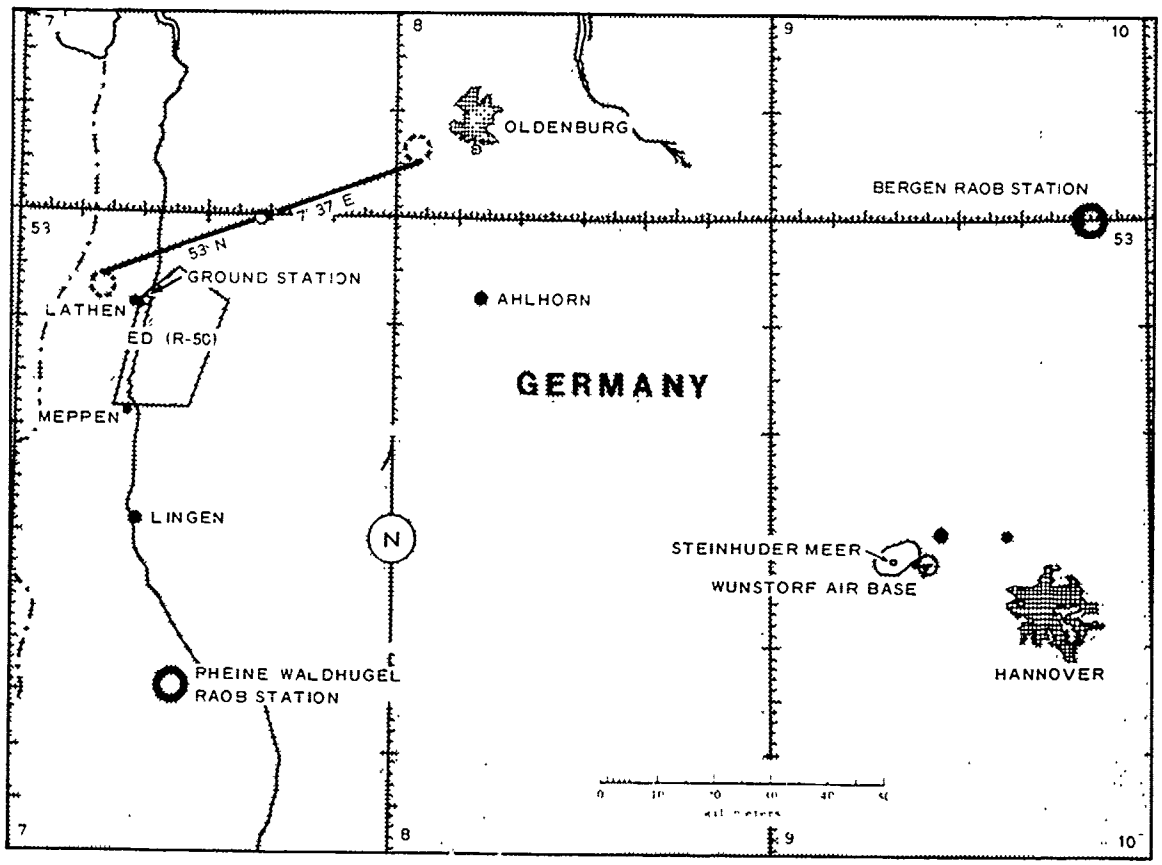


Fig 1-1e Typical Meppen Track and Data Sites, Detail Maps Latitude and Longitude References are to Flight Track Center Point

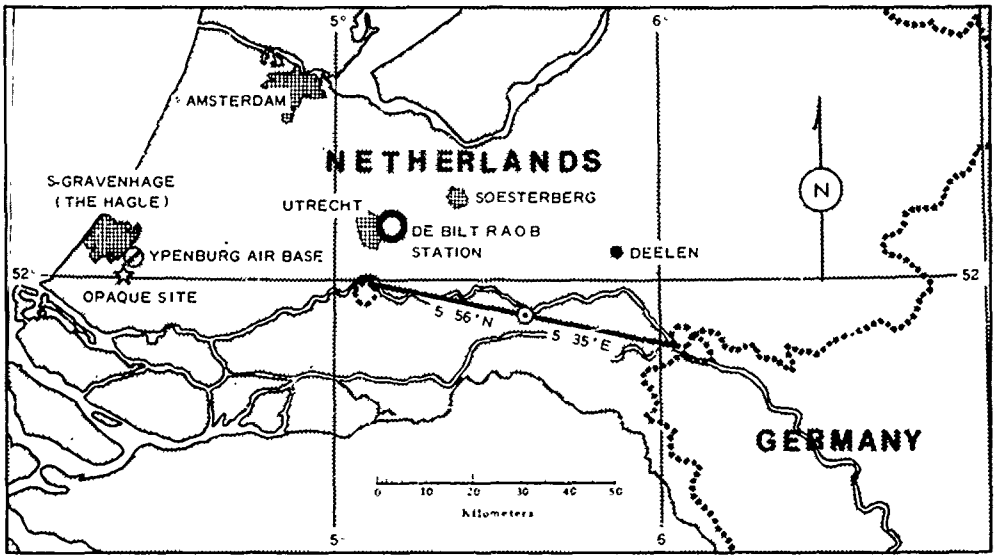


Fig. 1-1f Typical Soesterberg Track and Data Sites Detail Map Latitude and Longitude References are to Flight Track Center Point

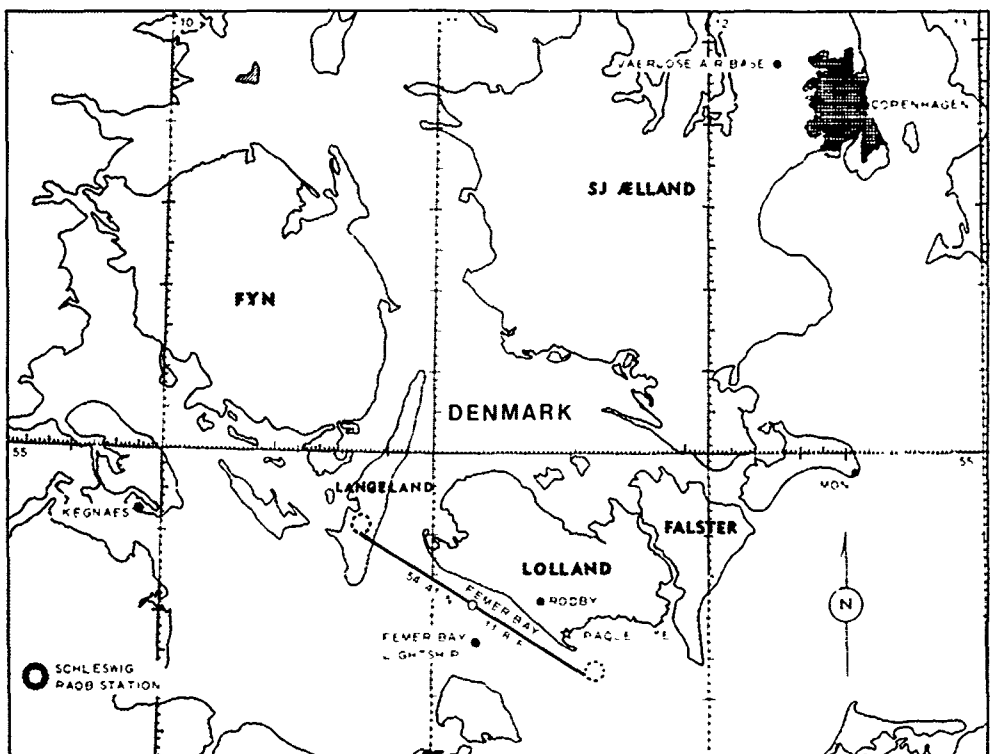


Fig 1-1g Typical Rodby Track and Data Sites, Detail Map Latitude and Longitude References are to Flight Track Center Point

The instrumentation used to generate the raw data upon which the reported properties are based consisted of an integrating nephelometer and a dual irradiometer. Corroborative data were obtained using a ground-based contrast reduction meter, to determine earth-to-space radiance transmittances when weather permitted, and a ground based integrating nephelometer.

The radiometer spectral responses were standardized for the OPAQUE V deployment in the manner illustrated in Fig. 1-2.

Data collection methods were similar to those reported in AFGL-TR-79-0159, Johnson and Gordon (1979). The highest straight and level altitude was approximately 6000 meters above ground level (AGL). The basic features of these stylized daytime flight profiles are summarized in Section 4.

The computer techniques used for processing the data included in this report are summarized in Section 5. They are, in general, the same as the techniques reported in AFCRL-TR-75-0457, Duntley, *et al.* (1975b).

A general discussion of the weather patterns that predominated in the northern European area during the data collection interval is presented in Section 6. This section, in conjunction with the flight track photographs shown in Section 7, is intended as an aid to the data user's generalized interpretation and evaluation. The inclusion of the graphical presentations is intended to further facilitate the user's rapid orientation with the overall weather situation.

The radiometric data representing 19 separate flights are also presented in Section 7. The presentation format is similar to that used in AFCRL-TR-79-0159, Johnson and Gordon (1979) since only scattering coefficient and irradiance data are included.

Discussion related to the interpretation and evaluation of the data collected is found in Section 8.

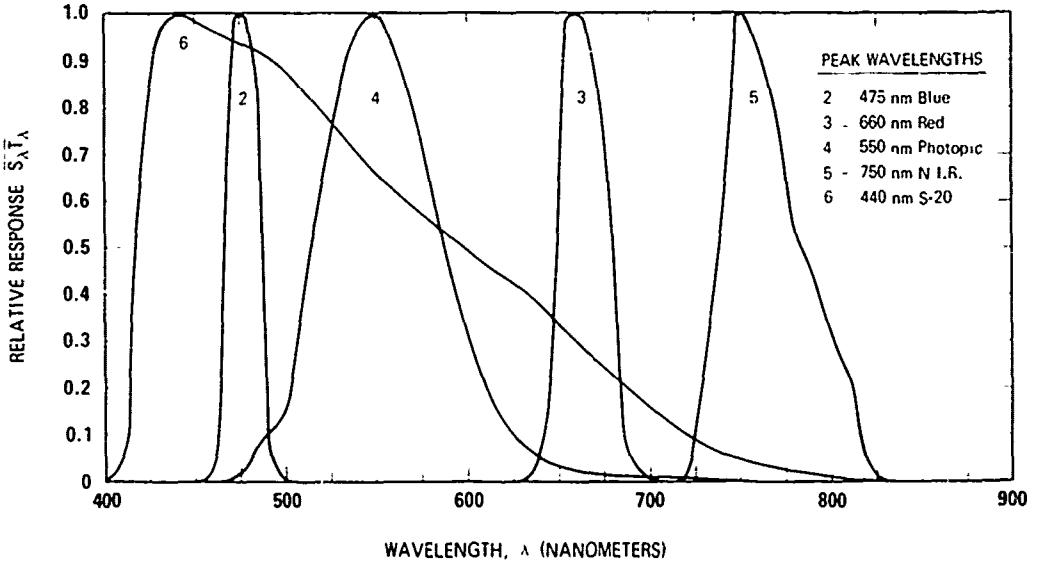


Fig. 1-2 Standard Spectral Responses - Project OPAQUE V

2. THEORY AND COMPUTATIONS

The underlying theoretical considerations upon which the data presentations made during this report interval are based have been specified for the most part in two early publications "Image Transmission by the Troposphere I" Duntley, *et al.* (1957) and "Model for a Clear Atmosphere". Gordon (1969). A discussion of the directional path reflectance format used in those reports which preceded the program OPAQUE series can be found in "Directional Reflectance of Atmospheric Paths of Sight," Duntley, (1969).

The computational procedures upon which the Visibility Laboratory bases its determinations of contrast transmission through the troposphere are documented in several preceding technical reports. The most recent of these, AFGL-TR-76-0188, "Airborne Measurements of Optical Atmospheric Properties in Northern Germany," Duntley, *et al.* (1976) is an appropriate reference and contains a substantial set of sample applications and references. Additionally, several procedural updates are described in AFGL-TR-78-0286, "Airborne Measurements of Optical Atmospheric Properties, Summary and Review III", Duntley, *et al.* (1978c).

The descriptive notes included in the following paragraphs have been extracted from the more complete descriptions contained in the references above. They are designed to support only the selected data appearing in Section 7 herein, and are not complete enough to develop contrast transmittance or any of the other more directional atmospheric optical properties normally associated with the reports in this series.

In addition, the radiometric nomenclature and notation has been modified slightly to more closely conform to the international standards summarized in Section 1 of Driscoll and Vaughn (1978). A summary of these notational changes is contained in Table 2.1 and they are fully reflected in the Glossary and Notation section of this report.

Table 2.1 Notational Equivalencies

Original VisLab Notation	Specified Quantity	Revised VisLab Notation
$T_r(z,\theta)$	Originally "Beam Transmittance" revised to "Radiance Transmittance"	$T_r(z,\theta)$
$L(z)$	Attenuation Length	$\mathfrak{L}(z)$
$H(z,d)$	Irradiance, downwelling	$E(z\,d)$
$H(z,u)$	Irradiance,upwelling	$E(z,u)$
$N(z,\theta,\phi)$	Radiance	$L(z,\theta,\phi)$

TOTAL VOLUME SCATTERING COEFFICIENT

A direct measure of air clarity is the atmospheric attenuation coefficient $\alpha(z)$. The parenthetical modifier indicates the altitude z. The attenuation coefficient is the sum of the total volume scattering coefficient and the absorption coefficient. If there is no absorption, the attenuation coefficient is numerically equal to the total volume scattering coefficient $s(z)$.

The total volume scattering coefficient may be defined by the equation

$$s(z) \equiv \int_{4\pi} \sigma(z, \beta)\, d\Omega \,, \tag{2.1}$$

where $\sigma(z, \beta)$ is the volume scattering function at altitude z and scattering angle β. The integrating nephelometer used to make the total volume scattering coefficient measurements performs the integral in Eq. (2.1) optically. It uses a parallel light beam and a cosine-law collector viewing the scattered flux. The instrument is similar in principle to one of four instruments for measuring total volume scattering coefficient described by Beuttell and Brewer (1949).

RADIANCE TRANSMITTANCE *(Preferred terminology, replacing Beam Transmittance)*

The radiance (beam) transmittance $T_r(z, \theta)$ at altitude z, zenith angle θ, and over path length r is obtained directly from the total scattering coefficient $s(z)$ by means of Eq. (2.2). (Refer also to Boileau (1964), p. 570.) When there is no significant atmospheric absorption in the passbands of the measurements, *e.g.*, from smoke, dust or smog, the attenuation coefficient $\alpha(z)$ is equivalent to the total volume scattering coefficient $s(z)$. Therefore

$$T_r(z, \theta) = \exp\left[-\sum_{i=1}^{n} \alpha(z_i)\, \Delta r\right] = \exp\left[-\sum_{i=1}^{n} s(z_i)\, \Delta r\right] . \tag{2.2}$$

where Δr is the incremental path length. The summations are made using the trapezoidal rule. The measured total volume scattering coefficient data are extrapolated to ground level when no ground-based measurements are available. The extrapolation assumes that the scattering particles are the same at all altitudes, but decrease or increase according to the density at each altitude $\rho(z)$:

$$s(0) = \frac{s(z)\rho(0)}{\rho(z)} \,. \tag{2.3}$$

Similarly, upward extrapolations are made to the highest reported altitude above ground level when the highest flight altitude is less Extrapolation in this case is based on the scattering coefficient measured at the highest flight altitude. The densities used for the extrapolations are based upon the *U. S. Standard Atmosphere (1962).* The density at each altitude is obtained by truncated Chebyshev Expansion using the coefficients for the atmosphere between 0 and 80 kilometers *[U. S. Standard Atmosphere Supplements* (1966), p. 69].

All altitudes reported are between ground level and 7.0 kilometers maximum. For all paths of sight at zenith angles less than 85 degrees or greater than 95 degrees, Δr equals $\Delta z \sec\theta$ for these altitudes. The Δr is always nonnegative since Δz is defined as $z_1 - z_2$ (the subscripts increase with the flux direction). See Fig. 2-1. The $|\Delta z|$ used is 30 meters (98.4 feet). For zenith angles greater than 95 degrees, the radiance transmittance can also be expressed as a function of the vertical radiance transmittance $T_r(z, 180°)$ ollows:

$$T_r(z,\theta) = T_r(z, 180°)^{|\sec\theta|} . \tag{2.4}$$

For upward paths of sight for zenith angles less than 85 degrees the radiance transmittance can similarly be expressed as a function of the vertical upward transmittance $T_r(z, 0°)$. The computations described above are useful in determining T_r for a variety of zenith angles, however, the data included in Section 7 of this summary report are restricted to the vertical path only.

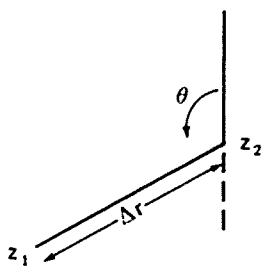


Fig 2-1 Path Length Geometry for Steeply Inclined Paths of Sight

ATTENUATION LENGTH *(Note change in notation)*

The attenuation length $\mathfrak{L}(z)$ is defined as the reciprocal of the atmospheric attenuation coefficient $\alpha(z)$. Therefore, when there is no significant absorption, it is also equivalent to the reciprocal of the atmopheric total volume scattering coefficient:

$$\mathfrak{L}(z) \equiv \frac{1}{\alpha(z)} = \frac{1}{s(z)} . \tag{2.5}$$

The equivalent attenuation length $\bar{\mathfrak{L}}(z)$ is a pseudo-attenuation length which, when combined with its altitude z, can be used directly in the equation [Boileau (1964), Eq. (6.1)].

$$T_r(z,\theta) = \exp[-z/\bar{\mathfrak{L}}(z)]|\sec\theta| , \tag{2.6}$$

where $\theta > 95°$ and path length r is between ground level and altitude z. Combining Eq. (2.6) and

Eq. (2.2) and appropriately rearranging, the following expression may be obtained for equivalent attenuation length,

$$\bar{\mathfrak{L}}(z_n) = \frac{z_n}{\sum_{i=1}^{n} s(z_i)\,\Delta z} \,. \tag{2.7}$$

For $\theta < 85°$, the $\bar{\mathfrak{L}}(z)$ values should be interpreted as applying to the target altitude, with the sensor at ground level.

EARTH CURVATURE AND REFRACTION

For the paths of sight at zenith angles from 90 to 95 degrees, the Δr for $|\Delta z| = 30$ meters (98.4 feet) is significantly longer at ground level than at 6 kilometers due to the curvature of the earth. Also for upward-looking paths of sight from 85 to 90 degrees, the Δr for $\Delta z = 30$ meters (98.4 feet) is significantly shorter at 6 kilometers than at ground level due to the curvature of the earth. Thus for paths of sight between 85 and 95 degrees in zenith angle, Eqs. (2.4) and (2.6) should not be used. Instead, Eq. (2.2) should be used with the appropriate Δr values.

DOWNWELLING IRRADIANCE *(Note change in notation)*

The downwelling irradiance on a horizontal flat plate may be defined by the equation

$$E(z,d) \equiv \int_{2\pi} L(z,\theta',\phi') \cos\theta' \, d\Omega \,, \tag{2.8}$$

where $L(z,\theta',\phi')$ is the radiance at altitude z in the direction of zenith angle θ' and azimuth ϕ'. The downwelling irradiance was measured by a dual irradiometer which performed the integration in Eq. (2.8) optically with a cosine-law collector. During the ascents and descents of the aircraft, when total volume scattering coefficient was being measured, the dual irradiometer was simultaneously measuring downwelling irradiance. The downwelling irradiance provides a quantitative measure of the ambient flux levels during the flight.

UPWELLING IRRADIANCE

The upwelling irradiance on a horizontal flat plate is designated by $E(z,u)$. The dual irradiometer alternately measured upwelling and downwelling irradiance at low, intermediate, and high altitude during intervals of straight and level flight which preceded or followed the ascents and descents.

ALBEDO

Albedo $A(z)$ is defined as

$$A(z) \equiv E(z,u)/E(z,d) \ . \tag{2.9}$$

Albedos were determined from the upwelling and downwelling irradiance measurements made with the dual irradiometer during the straight and level flight intervals for each flight.

RELATIVE HUMIDITY

The relative humidity is computed using the measured ambient temperature, the measured dewpoint temperature and their associated partial pressures of water vapor. The relative humidity in percent is computed from the equation

$$RH = [{}_sP({}_dt)/{}_sP(t)]\ 100 \ , \tag{2.10}$$

where ${}_sP({}_dt)$ is the vapor pressure at ambient temperature (equal to the saturated vapor pressure at dewpoint or frostpoint temperature), and ${}_sP(t)$ is the saturated vapor pressure at ambient temperature. The saturated vapor pressures over water and over ice are obtained from List (1966).

3. INSTRUMENTATION

The scientific instrumentation used for the Project OPAQUE V task was basically the same as that reported in AFCRL-TR-75-0457, Duntley, *et al.* (1976). Consequently, the descriptions contained herein have been edited to include only those systems directly related to the scattering coefficient and irradiance data. The total instrumentation package used during the Project OPAQUE V deployment is illustrated in Fig. 3-1 and 3-2.

3.1. RADIOMETRIC SYSTEMS

Of the seven different types of radiometric collector assemblies mounted on board the aircraft, only two have their descriptive summaries included in this report, the integrating nephelometer and the dual irradiometer.

INTEGRATING NEPHELOMETER (NEPH) ASSEMBLY

In order to measure and evaluate the total volume scattering coefficient for typical real aerosols, the Visibility Laboratory has devised and built an instrument referred to as an integrating nephelometer. The basic structure of the device consists of the subassembly illustrated in Fig. 3-3 and an enclosing light tight box. In the airborne version, ram air driven by the aircraft's forward velocity is routed through the box via four one-inch diameter inlet tubes and four one and one-half inch diameter exhaust tubes. In the ground based version, the airflow is drawn through the sampling volume by an exhaust fan located within the housing immediately adjacent to the exhaust ports. The somewhat larger shroud configuration used with the ground based nephelometer is illustrated in Fig. 3-2. In this view, the inlet probes are the vertical stacks at the right end of the shroud. The exhaust ports are in the bottom of the shroud at the nearer left end, and are not visible from the angle illustrated.

In its operational mode, the integrating nephelometer measures the radiant flux scattered by the transient aerosol as it passes through the geometrically well defined flux beam from a high intensity projector. The scattered flux is sequentially collected through one of three different optical channels: two telescopes, each having 2-degree circular fields of view oriented to collect the flux scattered in the $\beta=30°$ and $\beta=150°$ directions, and one 2π irradiometer assembly oriented to collect the flux scattered in all scattering angles between $\beta=5°$ and $\beta=172.5°$. From these measurements, plus the measurement of a well defined calibration flux level. the directional scattering functions $\sigma(30)$ and $\sigma(150)$ and the total volume scattering coefficient s may be derived.

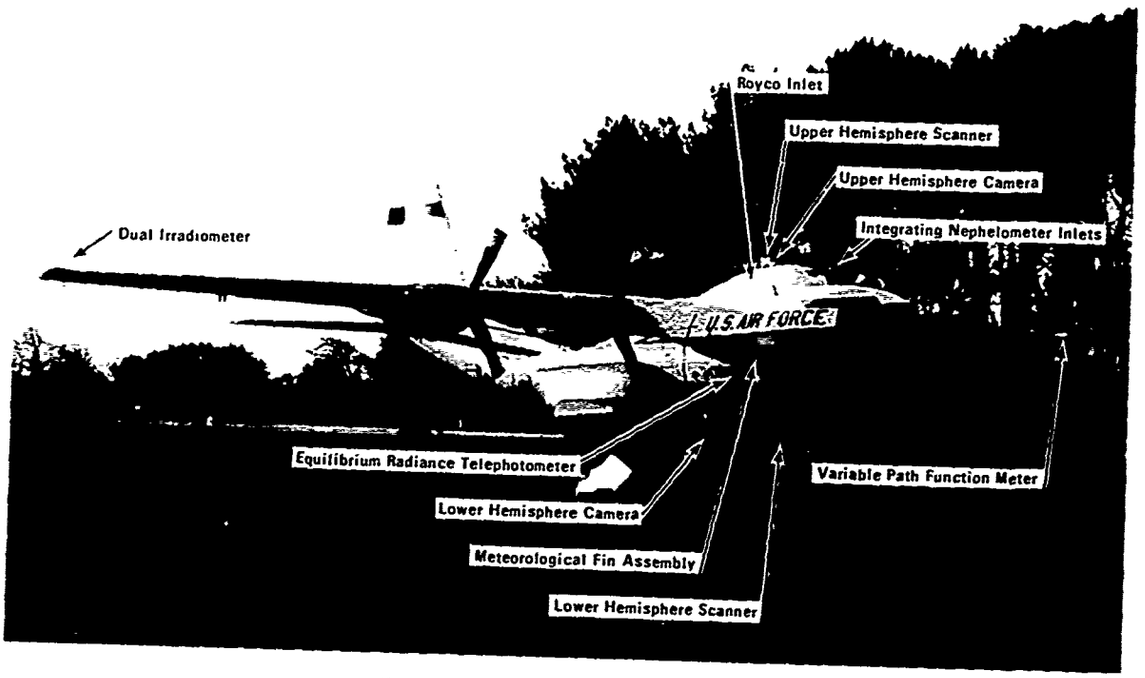


Fig 3-1 C-130 Airborne Instrument System

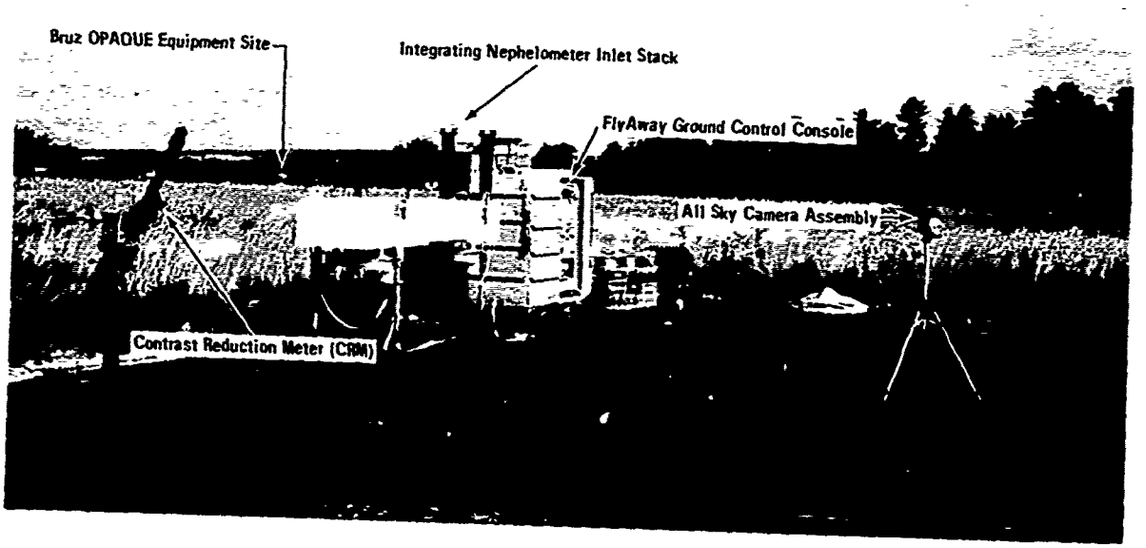


Fig 3-2 Ground-Based Instrument System

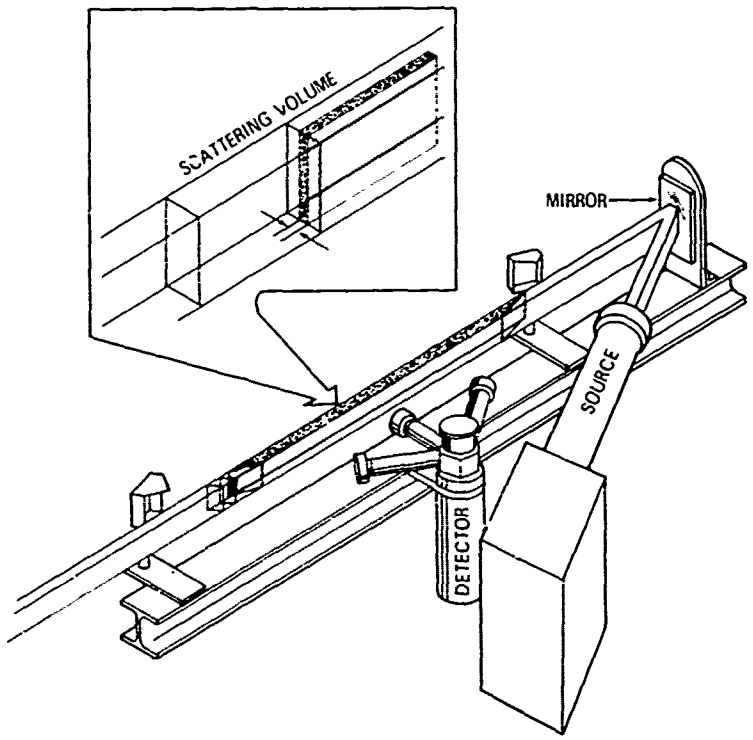


Fig 3-3 Artist's Rendition of Modified Integrating Nephelometer

In its simplest form, the equation which is used to compute the total volume scattering coefficient is

$$s = \frac{{}_{s}E\,K}{{}_{r}E\,F} \,. \tag{3.1}$$

where

${}_{s}E$ is the flux scattered from the beam and collected by the instrument's irradiometer channel while in the operational mode, and

${}_{r}E$ is the flux reflected from a diffusely reflecting calibration plaque and collected by the irradiometer channel while the instrument is in the calibration mode.

The constants K and F are rather extensive integral expressions which relate the geometry of the scattering volume with respect to the irradiometer cap location, the irradiance distribution in the flux beam, the transmittance and reflectance characteristics of the collector cap and calibration plaque, and the most probable shape of the scattering function associated with the sample aerosol.

The ratio K/F for the airborne integrating nephelometer has been computed using the Rayleigh volume scattering function and a set of ten additional volume scattering functions representative of a broad range of real atmospheres as determined from Barteneva (1960). Using the in-flight measured values of $\sigma(30)$ and $\sigma(150)$ from the nephelometer, the most probable scattering function for the sample aerosol can be selected, and the appropriate K/F factor applied. It is the application of this procedure for determining the most probable scattering function from measured data, and applying this supplementary knowledge of the character of the sample aerosol as a correction to the measurement for total scattering coefficient, which makes this instrument unique and potentially superior for research applications.

The mechanical and optical configurations of the integrating nephelometer used on the OPAQUE V deployment have changed from those reported in AFCRL-70-0137, Duntley, *et al.* (1970a). The basic change is that the projector beam has been optically folded by inserting a plane mirror into the beam between the projector and the beginning of the scattering volume. This optical folding, illustrated in Fig. 3-3, has enabled the shortening of the mechanical frame and housing such that the entire assembly can be enclosed in an aerodynamic shroud. The modified nephelometer is illustrated in AFCRL-TR-75-0457, Duntley, *et al.* (1975b). The operating characteristics of the revised nephelometer were discovered to suffer from abnormally high stray light problems during the post deployment analysis of the OPAQUE I and II data, and further modification was accomplished subsequent to its return to the Laboratory. Evaluation of the experimental and diagnostic evidences of these apparent stray light problems is continuing.

During several preceding OPAQUE deployments, occasional, spurious signals were detected which abnormally influenced the nephelometer measurements. These signals were of the form of a biasing square wave offset on the nephelometer output analog. An example of this influence is illustrated by the irregularities in the nephelometer profile for flight C-432 in AFGL-TR-79-0159, Johnson & Gordon (1979), page 7-28. Due to the intermittent nature and unexplained source of these data offsets, they were not edited out of the OPAQUE IV data base, but were left unaltered to alert potential users to the problem.

Subsequent to the OPAQUE IV deployment, it was determined that the spurious signals were generated somewhere within the aircraft electrical circuitry, and were not an artifact of the nephelometer system itself. The biasing offsets could not be duplicated within the Laboratory even though all of the airborne subsystems except the aircraft wiring harnesses were used in the test procedures, and the system was cycled continuously for several multi-day intervals.

Unfortunately, examination of the OPAQUE V data illustrated a significant increase in the frequency of occurrance of the spurious data, though the magnitude of the offset was conspicuously constant An extensive analysis indicated that the spurious offset was always in the same direction, such that the smaller values of scattering coefficient were the correct values. Thus it was decided to edit the nephelometer profile data to eliminate the offset intervals.

Two techniques were used to make the corrections to the nephelometer data. In the first procedure, the offset data were simply deleted from the data file, and the resulting data gap was filled by linear interpolation between the bounding measurements. This procedure was usually applied where the affected altitude interval was short, and the offset nephelometer data was nearly constant or

contained little structure. The second and more complex procedure was to define the altitude interval of the offset and then apply a multiplicative correction factor to each data point within the interval. This procedure retains the fine structure contained in the nephelometer measurements and was used in most cases where the altitude interval exceeded 100-200m.

The folded-path nephelometer is enclosed in the modified radome shown on top of the aircraft in Fig. 3-1, and an artist's rendition of the arrangement of the internal subassemblies is illustrated in Fig. 3-3.

DUAL IRRADIOMETER (DI) ASSEMBLY

The dual irradiometer assembly is a two-channel irradiometer. It has two optical input channels but only one optical output. A rotating prism subassembly allows the system operator to select either input channel for optical coupling with the output channel, while simultaneously occulting the other. The resultant time-sharing of a single detector assembly yields a device optimized for ratio type measurements.

The flat plate diffuse collector surfaces used in this assembly are mechanically corrected to yield cosine collection characteristics between 0 and 90 degrees which are within ± 2 percent of true cosine for all angles of incidence between 0 and 80 degrees.

The dual irradiometer assembly is mounted on the aircraft wingtip so that the flat plate collectors are horizontal during normal straight and level (ST&LV) flight elements. In this configuration the upper channel receives radiant flux from the entire hemisphere above the aircraft, and the lower channel receives radiant flux from the entire hemisphere below the aircraft. These measurements of downwelling and upwelling irradiance can be used both in the calculation of environmental albedos, $A(z)$, and in intersystem data validation checks.

The dual irradiometer optical system is normally purged with dry nitrogen and maintained at relatively low positive pressure (8-10*psi*) to prevent the accumulation and condensation of moisture on its internal optical components. It was apparent from an inspection of the OPAQUE IV data, that during some of the higher altitude ascents and descents, the pressurization failed. An artifact of this failure and its influence on the measurement of downwelling irradiance is shown in the data for flight C-432, in AFGL-TR-79-0159, Johnson & Gordon (1979) page 7-28. With the failure of the pressurization, it is possible for condensation to occur on the irradiometer's internal prism assembly which in turn induces an apparent decrease in measured irradiance. This decrease is illustrated in the Filter 3 irradiance measured during the descent mode of flight C-432. The anomalous decrease begins at about 3 km AGL, and influences the measurements at all altitudes below this threshold.

Because there was insufficient evidence to confidently identify this anomalous behavior during the preparation of the OPAQUE IV data report, the irradiometer data were not edited. However, during the OPAQUE V deployment, there were several repurging sequences that enabled a reliable assessment of the fault, and thus indicated the unreliability of the measurements. As an outgrowth of the OPAQUE V analysis, several portions of the irradiometer profiles have been deleted. In general these deletions are for data measured on a descent following substantial time intervals at maximum altitude

(*i.e.* 6 km AGL). In all cases the deletions begin at 4 km AGL, the condensation threshold as indicated by the data. *e.g.* flight C-462.

3.2. METEOROLOGICAL SYSTEMS

All of the meteorological systems used in this project were purchased items; the operating characteristics of each are available in the appropriate manufacturer's brochures. For use in Project OPAQUE V, the meteorological systems were unchanged from the configurations reported in AFCRL-72-0593, Duntley, *et al.* (1972c).

The airborne meteorological package consisted of one Royco Model 220 particle counter, one Cambridge Model 137-C3 aircraft hygrometer system, one AN/AMQ-17 aerograph set, and two Bourns aneroid pressure transducers.

Since all of the meteorological systems were described in AFCRL-72-0593, Duntley, *et al.* (1972c), no further discussion is included in this report.

3.3. CONTROL AND COMMUNICATION SYSTEMS

The basic control panels, consoles, and other support facilities associated with the airborne instrument system are described fully in AFCRL-72-0593, Duntley, *et al.* (1972c).

3.4. PHOTOGRAPHIC SYSTEMS

Photographic documentation of the test environment performed simultaneously with the radiometric and meteorological measurements has always been a highly desirable adjunct to any field activity. For Project OPAQUE V, this photographic documentation was accomplished by the Visibility Laboratory through the use of two camera systems.

AIRBORNE AUTOMAX G-1 CAMERA SYSTEM

Two 35-millimeter Automax G-1 cameras, modified to accept Traid 735 Periphoto (180-degree) lenses, were mounted on the project aircraft (Fig. 3-1). One camera was oriented to photograph the 2π upper hemisphere and the other covered the 2π lower hemisphere. Either or both cameras may be run in either cine or single-frame modes at the discretion of the operator.

The photographs from these cameras are used only as general background for the interpretation of the radiometric measurements. Thus, no special controls are placed upon the film or its processing. For this general-purpose application, the cameras are normally loaded with Kodak Ektacolor Professional S, No. 5026 film. Typical photographs from this system are used as illustrations in Section 7 of this report and were shot with a fixed f6.3 aperture in the single-frame mode.

GROUND-BASED SOLIGOR SYSTEM

The ground-site documentation photographs have historically been limited to 35-millimeter color snapshots, taken on a casual basis during lulls in the experimental sequences. For Project OPAQUE V, this procedure was supplemented with a scheduled routine of site photographs using a Soligor Conversion Fisheye lens. This lens possesses almost universal adaptability to a wide variety of cameras and prime lenses. During Project OPAQUE V, it was used on a Yashica, Lynx 1000.

3.5. RADIOMETRIC CALIBRATION PROCEDURES

All the radiometers used in this project are calibrated in essentially the same manner. In each case, the system is calibrated first by determining its relative flux versus high voltage characteristics over the anticipated operating span and second by establishing known absolute flux levels on this voltage curve. The entire calibration procedure is conducted by using standard photometric practices, a 3-meter optical bench, and incandescent standards of luminous intensity traceable to the National Bureau of Standards.

A detailed discussion of these calibration procedures is contained in AFCRL-70-0137, Duntley, *et al.* (1970a), AFGL-TR-76-0188, Duntley, *et al.* (1976), and most of the intervening reports in this series. The discussion therefore will not be repeated herein.

A typical data sheet for the absolute calibration of a Project OPAQUE V radiometer is shown in Fig. 3-4. Five different levels of input radiance are used in the determination of the calibration constant for the system. The calibration constant is referred to as the zero scale value and is labeled ZSV on the calibration forms.

ABSOLUTE CALIBRATION FOR

E101 (EPHI-1 SIGMA 421251 NSI E IRRADIOMETER) TAKEN ON 12/19/78 (POSTOPOV) DEPLOYMENT

FILTER NO. 4 (CLEAR) 5500 DEGREES K(VEIN)

SPAN ID	DI CM	TOTAL DIST. CM	TOTAL DIST.SQ. CM.SQ.	CALC.TOT. A OR E *	DETEC. RAW OUTPUT	LOG OF (RP/RI)	RAW ZSV	PERCENT DIFF OF RAW AVG	AVG RAW ZSV	F1 LUM. TO RAD. WATTS/LUM.	F2 COLOR MATCH	CORRECTED ZSV
1	40	1616.100	1.35JE 04	7.5806E-05	645	0	0	0	5.251E-05	1.050E-03	1.017E 00	5.639E-08
2	70	3636.100	6.11GE 04	6.796E-05	653	.043	5.294E-05	-.8				
3	120	1296.100	5.45JE 04	2.663E-05	626	.294	5.244E-05	-.1				
4	200	2704.100	7.67JE 04	1.364E-05	573	.599	5.219E-05	.6				
5	100	676.100	1.41GE 05	7.246E-06	535	.856	5.201E-05	1.0				
6	100	676.100	1.41GE 05	7.246E-06	533	.856	5.201E-05	1.0				
4	200	2704.100	7.67JE 04	1.364E-05	573	.599	5.219E-05	.7				
3	120	1296.1	5.45JE 04	2.663E-05	626	.294	5.239E-05	.2				
2	70	3636.100	6.11GE 04	6.796E-05	659	.052	5.289E-05	-2.8				
1	40	1616.100	1.35JE 04	7.5806E-05	645	0	0	0				

LINEARITY MAXIMUM E -.0001 APPLIED CUTOFF = E -.0773
LINEARITY ACTUAL END E -.0773 FULL SCALE = E-10323 CUTOFF = E -.0773

* CALIBRATE ILLUMINANCE IN LUMENS/SQ.CM.

RAW ZSV STD = E 6.4444E-07 FRACTL STD = E 1.226J PERCENT ZSV IN WATTS/SQ. CM. IS 5.630E-08

WITH THIS CONVERSION FA FOR OF E 127439.9999991 TO CHANGE UNITS FROM WATTS/SQ. CM TO WATTS/SQ. M (MICRO M) THE NEW ZSV IN WATTS/SQ. M MICRO M. IS F 139659-03

THIS FF YER IS BASED PHOTOPIC TO CONVERT TO TRUE PHOTOPIC STANDARD (SEE TECHNICAL MEMORANDUM AVTE-0057)
FOR DAY LIGHT DATA MULTIPLY BY 72.0000LUMENS-HR / WATT. PHOTOPIC ZSV IS 5.1398E-01 LUM W/ SQ M.
FOR NIGHT TIME L SHTING MULTIPLY BY 68.3403LUMENS-HR / WATT. PHOTOPIC ZSV IS 4.8785E-01 LUMEN/ SQ M.
FOR N ME METER ONLY MULTIPLY BY 72.2161LUMENS-HR / WATT. PHOTOPIC ZSV IS 5.1552E-01 LUMEN/ SQ M.

DURING EACH CALIB MEASUREMENT		
SPAN ID	STD. DEV. IN MV	FRACT STD DEV IN PERCENT
1	4.19JE-01	.2756-01
2	4.093E-01	9.760E-02
3	2.590E-01	5.867E-02
4	4.093E-01	1.066E-02
5	5.000E-01	1.493E-01
6	5.390E-01	1.493E-01
4	5.416E-01	9.015E-02
3	0	0
2	0	*
1	0	*

CALIBRATION LAMP IDENTIFICATION	
SERIAL NUMBER =	VL40201
LAMP INTENSITY =	20.52
DISTRIBUTION TEMPERATURE =	2854
MONITOR CURRENT CHANNEL =	4

CALIBRATION TARGET DATA	
REFLECTANCE OF PATH ATTENUATOR(PERCENT) =	5.0
REFLECTANCE OF CALIBRATION TARGET(PERCENT) =	100.0
DTOTAL = LAMP DISTANCE + D3 + D2. D2 (CM) =	76.3
PHOTOMETER DATA CHANNEL =	1

Fig. 3-4. Typical Absolute Calibration Form.

CALIBRATION CORRECTION FACTORS

Several calibration correction factors are used with the calibration data illustrated in Fig. 3-4 to generate the calibration constants listed in Table 3.1. In general, the factors are used at will to convert radiometric units into photometric units and reconvert them, and to adjust the value of measurements taken with an instrument having a nearly standard spectral response to the value that would have been obtained using the exact standard spectral response specified in Section 3.6.

These correction factors are discussed at length in AFCRL-70-0137 and AFCRL-72-0461, Duntley, *et al.* (1970a and 1972b). Thus, they are not discussed further at this time.

Table 3.1. Project OPAQUE V Radiometer Calibration Constants (ZSV) and Related Fractional Standard Deviations (δ) For Daylight Flights

Radiometer Identification		Calib Mode	Calib Units	Filter 2		Filter 4		Filter 3		Filter 5		Average δ% for System
System	MPT SN			ZSV	δ%	ZSV	δ%	ZSV	δ%	ZSV	δ%	
NEPHI Σ	21253	Out	$w/m^2\mu m$	2 25E−02	1	7 14E−03	1	6 50E−02	2	5 17E−01	2	1
NEPHI β 30	21253	Out	$w/\Omega m^2\mu m$	2 01E−01	2	7 24E−03	1	6 88E−02	1	7 14E−01	1	1
DI	9858	In	$w/m^2\mu m$	3 12E 04	3	8 83E 03	2	3 62E 04	2	7 33E 04	2	1

3.6. STANDARD RESPONSE CHARACTERISTICS FOR BROAD BAND SENSORS

A summary of the response characteristics of the standards for Project OPAQUE V is presented in Table 3.2. The first four columns give filter code, peak wavelength $\hat{\lambda}$, mean wavelength $\bar{\lambda}$, and effective passband, $\delta\lambda$ (previously referred to as "response area"), terms which are fully defined in preceding reports such as AFGL-TR-76-0188, Duntley, *et al.* (1976) and in the Glossary and Notation section of this report. The values for inherent solar properties are in columns 5, 6, and 7, and the Rayleigh limits are in columns 8, 9, 10. The table was produced by Program RAYLIMIT, Gordon, (1972) which computes several optical properties of idealized Rayleigh atmospheres as a function of selected spectral passbands.

Table 3.2. Spectral Characteristics Summary for Project OPAQUE V

Spectral Characteristics for Project OPAQUE V				Inherent Sun Properties [Johnson(1954)]			Rayleigh Atmosphere Properties (15°C)		
Filter Code No	Peak Wavelength (nm)	Mean Wavelength (nm)	Effective Passband	Irradiance ($w/m^2\mu m$)	Radiance ($w/\Omega m^2\mu m$)		Attenuation Length (m)	Total Scattering Coefficient (per m)	Vertical Beam Transmittance
					Average	Center			
2	475	478	19 9	2.14E+03	3 13E+07	4 07E+07	4.84E+04	2 07E−05	0 839
3	660	654	30 2	1 57E+03	2.30E+07	2 75E+07	1 86E+05	5.41E−06	0 955
4	550	557	78 5	1.90E+03	2.78E+07	3 47E+07	8 93E+04	1.15E−05	0 907
5	750	765	50 4	1 23E+03	1 80E+07	2 10E+07	3 28E+05	3 08E−06	0 974
6	440	532	183 5	1.91E+03	2.80E+07	3 55E+07	7.22E+04	1 64E−05	0 867
9	555	560	106 9	1 89E+03	2.77E+07	3 45E+07	9.22E+04	1.15E−05	0 907

All the radiometric instruments, both ground-based and airborne, used by the atmospheric visibility branch are equipped with automatic filter changing assemblies. Thus, any one of five different spectral filters can be interposed into each instrument's optical path. The combination of the sensor sensitivity S_λ and the filter transmittance T_λ is the resultant sensitivity of the filtered phototube $S_\lambda T_\lambda$. The standard responses which each optical system attempts to duplicate are indicated as $\overline{S_\lambda T_\lambda}$, and are illustrated in Table 3.3. No system has true photopic response, Filter Code 9, but this ideal response is included for comparative purposes only.

Table 3.3. Relative Spectral Response of Standards for Project OPAQUE V

Wavelength (nm)	No 2 Blue 478nm	No 3 Red 664nm	No 4 Pseudo Photopic 557nm	No 5 NIR 765nm	No 6 S-20 532nm	No 9 True Photopic 560nm
400	0	0	0	0	0	0 0004
405	0	0	0	0	0 0129	0 0006
410	0	0	0	0	0 0258	0 0012
415	0	0	0	0	0 2969	0 0022
420	0	0	0	0	0 5680	0 0046
425	0	0	0	0	0 7605	0 0073
430	0	0	0	0	0 9530	0 0116
435	0	0	0	0	0 9765	0 0168
440	0	0	0	0	1 0000	0 0230
445	0	0	0	0	0 9920	0 0298
450	0	0	0	0	0 9840	0 0380
455	0	0	0	0	0 9720	0 0480
460	0 0070	0	0	0	0 9600	0 0600
465	0 1487	0	0	0	0 9510	0 0739
470	0 8481	0	0	0	0 9420	0 0910
475	1 0000	0	0 0172	0	0 9355	0 1126
480	0 9329	0	0 0343	0	0 9290	0 1390
485	0 8304	0	0 0677	0	0 9175	0 1693
490	0 1790	0	0 1010	0	0 9060	0 2080
495	0 0292	0	0 1185	0	0 8920	0 2586
500	0	0	0 1360	0	0 8780	0 3230
505	0	0	0 2635	0	0 8560	0 4073
510	0	0	0 3910	0	0 8340	0 5030
515	0	0	0 5085	0	0 8135	0 6082
520	0	0	0 6260	0	0 7930	0 7100
525	0	0	0 7345	0	0 7715	0 7932
530	0	0	0 8430	0	0 7500	0 8620
535	0	0	0 9065	0	0 7250	0 9149
540	0	0	0 9700	0	0 7000	0 9540
545	0	0	0 9850	0	0 6785	0 9803
550	0	0	1 0000	0	0 6570	0 9950
555	0	0	0 9665	0	0 6385	1 0002
560	0	0	0 9330	0	0 6200	0 9950
565	0	0	0 8685	0	0 6030	0 9786
570	0	0	0 8040	0	0 5860	0 9520
575	0	0	0 7195	0	0 5700	0 9154
580	0	0	0 6350	0	0 5540	0 8700
585	0	0	0 5525	0	0 5385	0 8163
590	0	0	0 4700	0	0 5230	0 7570
595	0	0	0 3950	0	0 5060	0 6949
600	0	0	0 3200	0	0 4890	0 6310
605	0	0	0 2630	0	0 4755	0 5668
610	0	0	0 2060	0	0 4610	0 5030

Wavelength (nm)	No 2 Blue 478nm	No 3 Red 664nm	No 4 Pseudo Photopic 557nm	No 5 NIR 765nm	No 6 S-20 532nm	No 9 True Photopic 560nm
615	0	0	0 1680	0	0 4500	0 4412
620	0	0	0 1300	0	0 4390	0 3810
625	0	0	0 1055	0	0 4260	0 3210
630	0	0	0 0810	0	0 4130	0 2650
635	0	0 0020	0 0657	0	0 3935	0 2170
640	0	0 0486	0 0504	0	0 3740	0 1750
645	0	0 1798	0 0411	0	0 3545	0 1382
650	0	0 5531	0 0318	0	0 3350	0 1070
655	0	0 9948	0 0268	0	0 3190	0 0816
660	0	1 0000	0 0218	0	0 3030	0 0610
665	0	0 9421	0 0188	0	0 2845	0 0446
670	0	0 8625	0 0157	0	0 2660	0 0320
675	0	0 7482	0 0139	0	0 2480	0 0232
680	0	0 4774	0 0120	0	0 2300	0 0170
685	0	0 1585	0 0105	0	0 2105	0 0119
690	0	0 0495	0 0090	0	0 1910	0 0082
695	0	0 0166	0 0080	0	0 1755	0 0057
700	0	0	0 0070	0	0 1600	0 0041
705	0	0	0 0061	0	0 1445	0 0029
710	0	0	0 0053	0	0 1290	0 0021
715	0	0	0 0048	0	0 1170	0 0015
720	0	0	0 0042	0	0 1050	0 0010
725	0	0	0 0038	0 1005	0 0938	0 0007
730	0	0	0 0033	0 2010	0 0826	0 0005
735	0	0	0 0030	0 4155	0 0723	0 0004
740	0	0	0 0026	0 6300	0 0619	0 0003
745	0	0	0 0025	0 8150	0 0558	0 0002
750	0	0	0 0023	1 0000	0 0497	0 0001
755	0	0	0 0020	0 9595	0 0416	0 0001
760	0	0	0 0018	0 9190	0 0335	0 0001
765	0	0	0 0017	0 8495	0 0292	0
770	0	0	0 0016	0 7800	0 0249	0
775	0	0	0 0014	0 6620	0 0206	0
780	0	0	0 0013	0 5440	0 0162	0
785	0	0	0 0012	0 4890	0 0144	0
790	0	0	0 0012	0 4340	0 0125	0
795	0	0	0 0012	0 3720	0 0107	0
800	0	0	0 0011	0 3100	0 0088	0
805	0	0	0 0005	0 2675	0 0075	0
810	0	0	0	0 2250	0 0062	0
815	0	0	0	0 1125	0 0031	0
820	0	0	0	0	0	0

4. DATA COLLECTION METHODS

During Project OPAQUE V, two independent activities were conducted simultaneously. The operation of the airborne instrument system was one activity and that of the ground-based instrument system was the other. The procedural routine was for each system to run full data collection sequences at every opportunity, on a daily schedule, as weather permitted.

4.1. AIRBORNE SYSTEM

The data collection sequence for the airborne system was broken into five standardized elements: (1) preflight warmup and calibration check, (2) straight and level sequences, (3) vertical profile sequences, (4) in-flight calibration checks, and (5) post-flight calibration check.

An illustration of our typical flight pattern, which was used for most OPAQUE V flights, is shown in Fig. 4-1. In this stylized pattern, two basic elements, the straight and level (ST&LV) and the vertical profile (V-PRO), were combined to yield the total mission flight plan. A description of these two pattern elements and the calibration elements is detailed in AFCRL-72-0255, Duntley, *et al.* (1972a), modified in AFCRL-TR-75-0457, Duntley, *et al.* (1975b), and summarized in the following paragraphs.

1. Straight and Level runs (ST&LV), Mode 03 - The ST&LV runs were primarily 2π scanner runs. The measurement of upper and lower hemisphere radiance distributions had top priority. One sky mode scanner pattern (192 seconds) plus one sun mode scanner pattern (64 seconds) were run at each altitude with each of the two optical filters.

   During ST&LV runs the aircraft maintained a fixed heading, a constant indicated airspeed of 150 knots or less, and a 2.5 degree nose-high flight attitude.

2. Vertical Profile runs (V-PRO), Mode 07 - The V-PRO runs were primarily integrating nephelometer and variable path function meter runs. The measurement of the total scattering coefficient profile had top priority. Second priority was measurement of the vertical path function profile. Each V-PRO ascent or descent was made using a single filter.

   During the V-PRO runs the aircraft maintained a fixed heading, with the sun off the left wingtip, and a flight attitude not exceeding 4 degrees nose down or 8 degrees nose up. An average rate of climb or descent of 1200 feet/minute was optimum, and airspeed was not critical, but remained constant once established.

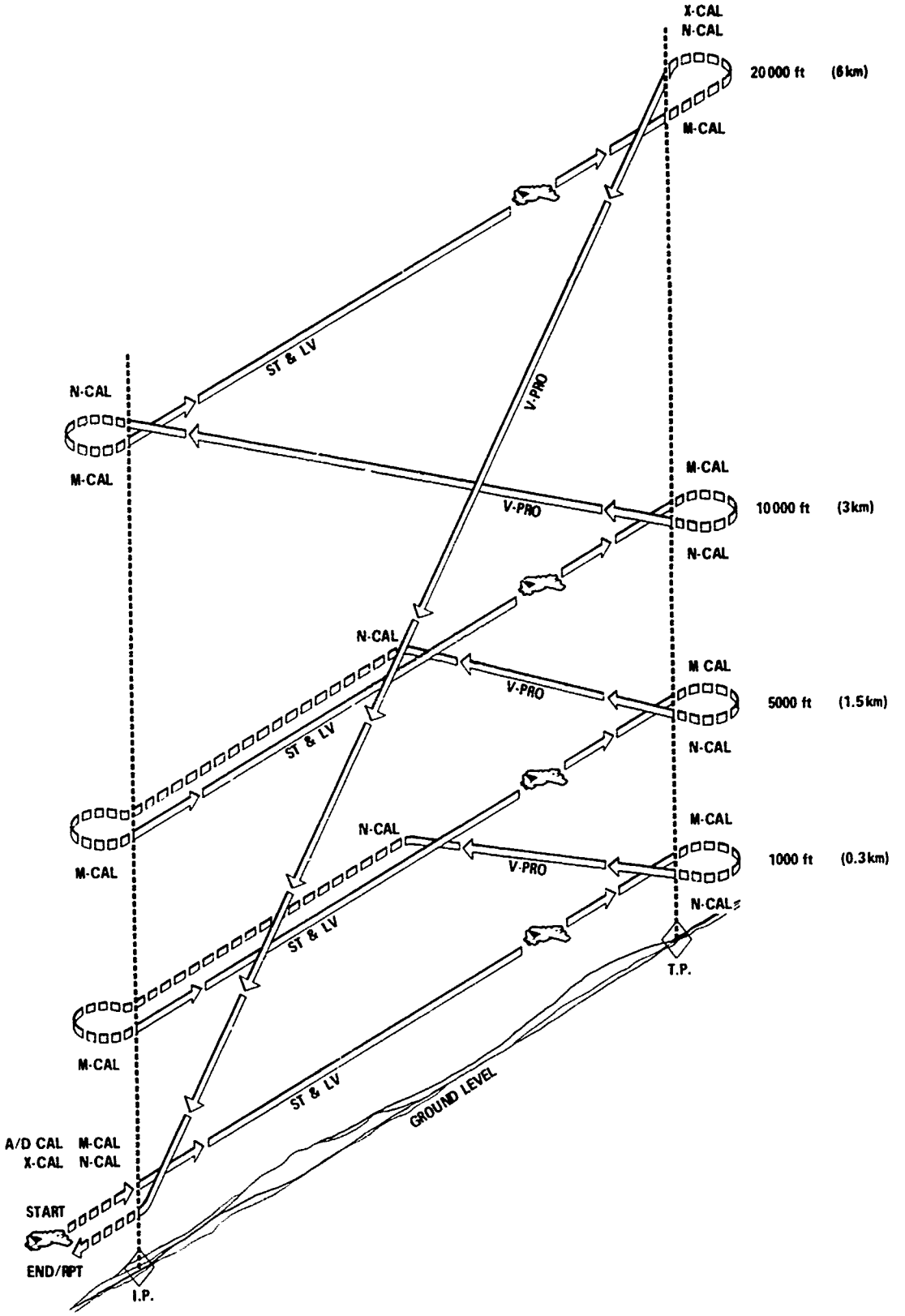


Fig 4-1 Typical Visibility Laboratory Flight Profile

3. Cross-Calibration Climbs (X-CAL), Mode 08 - The X-CAL climbs were specifically designed to validate the performance of the UHS, LHS, and ERT radiometer systems. The simultaneous measurement of a common uniform segment of sky by these three radiometers had top priority. Two X-CAL climbs were associated with each standard profile, one preceding the first ST&LV run and the second following the last ST&LV run. Both sky mode and sun mode measurements were made with the UHS system.

   During the 4-minute X-CAL climb the aircraft maintained a fixed heading, with the sun in the aft hemisphere, and a 5-degree nose-high flight attitude. The aircraft was flown directly toward the clearest and most uniform portion of the sky as was practical.

4. Calibration Blocks (A/D CAL), Mode 00, M-CAL, Mode 01 N-CAL, Mode 09 - The 32-second blocks of calibration data were inserted periodically throughout the entire data mission. They were designed to provide calibration update information to the post-flight computer processing sequences. There are 21 assorted calibration blocks associated with each standard profile.

   During these calibration blocks there were no project-imposed requirements upon aircraft speed or attitude.

GENERAL FLIGHT PATTERN

The standard (2+4) profile is illustrated in Fig. 4-1. In this profile, ST&LV data runs were made using two different spectral filters at each of four altitudes. The ascent V-PRO was made using the first of the two filters, and the descent V-PRO was made using the second. After the descent V-PRO, the entire sequence was repeated using a second pair of filters.

The idealized flight profile would result in all ground tracks falling on a single line running between the Initial Point (I.P.) and the Turning Point (T.P.). See Fig. 4-1. In practice, the ST&LV elements were actually stacked in a slab of atmosphere approximately 30 miles (48 km) long, 0.5 mile (0.8 km) wide, and 4 miles (6.4 km) high.

Periodically, in response to specialized data requirements or weather conditions, supplementary flight patterns were added to the mission profile. For OPAQUE V, a pattern made up of a (2+3) profile, *i.e.*, two spectral filters at each of three altitudes was used as was a (2+2) profile, *i.e.*, two spectral filters at each of two altitudes. Both the (2+3) and (2+2) profiles are generally considered low to medium altitude profiles, and were normally used on flights performed under a full overcast or low to intermediate level cloud decks. Three flights consisted of V-PRO climb outs, supplemented with only directional scattering measurements at the minimum and maximum altitudes.

At the conclusion of each mission, the radiometric data which were recorded and stored on magnetic tape were returned to the Visibility Laboratory for computer reduction and analysis.

4.2. GROUND-BASED SYSTEM

The ground-based data collection sequence was designed to supplement the airborne data whenever the aircraft was operating in the immediate vicinity. However, it was also complete enough

to stand alone when the aircraft mission was diverted or aborted.

During the OPAQUE V deployment, the fly-away Contrast Reduction Meter (CRM) and an integrating nephelometer were used on the ground station.

The primary function of the CRM system is to determine the earth-to-space radiance (beam) transmittance for comparison with the data from the airborne systems. The basis for the measurement techniques using the CRM was first presented by Gordon, *et al.* (1963) and validated by Duntley, *et al.* (1964). It is also discussed in Edgerton (1967) and summarized in Gordon, *et al.* (1973). A similar configuration of the device is described in Duntley, *et al.* (1970b).

The operational and computational procedures related to the CRM system are described in detail in Duntley, *et al.* (1972b), and briefly summarized in the following paragraph.

Four basic measurements using the CRM are required in order to provide proper inputs to the computation of earth-to-space universal contrast transmittance. They are:

1. Apparent Solar Radiance.
2. Path Radiance, *i.e.*, Sky Radiance, at an appropriate scattering angle from the sun.
3. Total Downwelling Irradiance.
4. Inherent Background Radiance, *i.e.*, generally a selected terrain radiance.

Since the CRM is conceived as a clear day system, requiring clear skies, its daily data collection schedule was occasionally cut short by variable cloud build-ups during the OPAQUE V deployment. Under highly variable weather conditions, priority is assigned to measurements of apparent solar radiance in order to retrieve a maximum number of determinations for atmospheric radiance (beam) transmittance. These measurements are recorded manually for subsequent insertion into the automatic data processing and evaluation procedure.

The ground based integrating nephelometer used during OPAQUE V was a folded path device, optically equivalent to the airborne system. It was constructed using the major mechanical and optical components from an earlier truck mounted system.

This rebuilt ground based integrating nephelometer and the airborne model used identical detectors, mode selector heads, calibrators, and mirror assemblies. The projectors were both 500 watt Xenon, however there were minor differences in the lamp housings. The only significant difference between the two systems was in the shroud design. The ground based shroud is considerably larger, hence the interior stray light problems should be smaller. The light trap for the ground nephelometer projector beam is further from the sampling volume and is a more efficient design; thus its influence on the scattering volume should be less. The ground based shroud has a built-in exhaust fan to draw the aerosol through the main shroud instead of using ram air as does the airborne model. Data recording, as with the CRM, was manual.

5. DATA PROCESSING

As in any reasonably complex, multi-input sampled data system, there is a large amount of data handling required before the scientific analyst ever sees the package. The degree of data processing sophistication used during this contract interval is illustrated in Fig. 5-1 and 5-2. In these generalized flow charts, the basic functional steps used in the data processing of the raw field data are clearly specified. They do not illustrate, however, all of the miscellaneous routines used for data base management and special diagnostic purposes. A more complete description of each phase of the processing sequence is contained in AFCRL-72-0255, AFCRL-72-0593, Duntley, *et al.* (1972a and c), and AFCRL-TR-75-0457, Duntley, *et al.* (1975b).

5.1. AIRBORNE DATA

As described in AFCRL-72-0255, Duntley, *et al.* (1972a), several classes of data are recorded during an airborne data set: (1) radiometer outputs, (2) selector control codes, (3) transducer orientation and flight attitude signals, and (4) calibration voltages, etc. All systems, regardless of type, have been designed for an electrical output between 0 and ±1 volt dc for full scale. The 42 channel data logger has a least count of ±1 millivolt and records in digital format at a multiplex rate of 240 samples per second and a tape rate of 3.56 inches per second at a recording density of 200 bits per inch.

Several major improvements to the airborne data processing procedure have been implemented during the interval since AFCRL-72-0593, Duntley, *et al.* (1972c) and AFCRL-TR-75-0457, Duntley, *et al.* (1975b). The insertion of these programs is summarized in AFGL-TR-76-0188, Duntley, *et al.* (1976) and is illustrated in Fig. 5-1. Subsequent comment related to these and similar procedural updates is contained in AFGL-TR-78-0168, "Airborne Measurements of Optical Atmospheric Properties, Summary and Review III", Duntley, *et al.* (1978c). These programs, and the increased diagnostic capabilities that their usage has enabled, have materially improved the quality of the upper hemisphere radiance maps, and thus the quality of all subsequently computed optical atmospheric properties.

In order to produce the data included in this short form report, it was not necessary to run the programs illustrated in the upper portion of Fig. 5-1. That is, those programs related to the processing of automatic scanner data, MIRESCAN, SCANTSUM, etc., were bypassed. In this manner the AVIZC130 runs were shortened to only the first overlay for the production of scattering coefficient and radiance transmittance profiles.

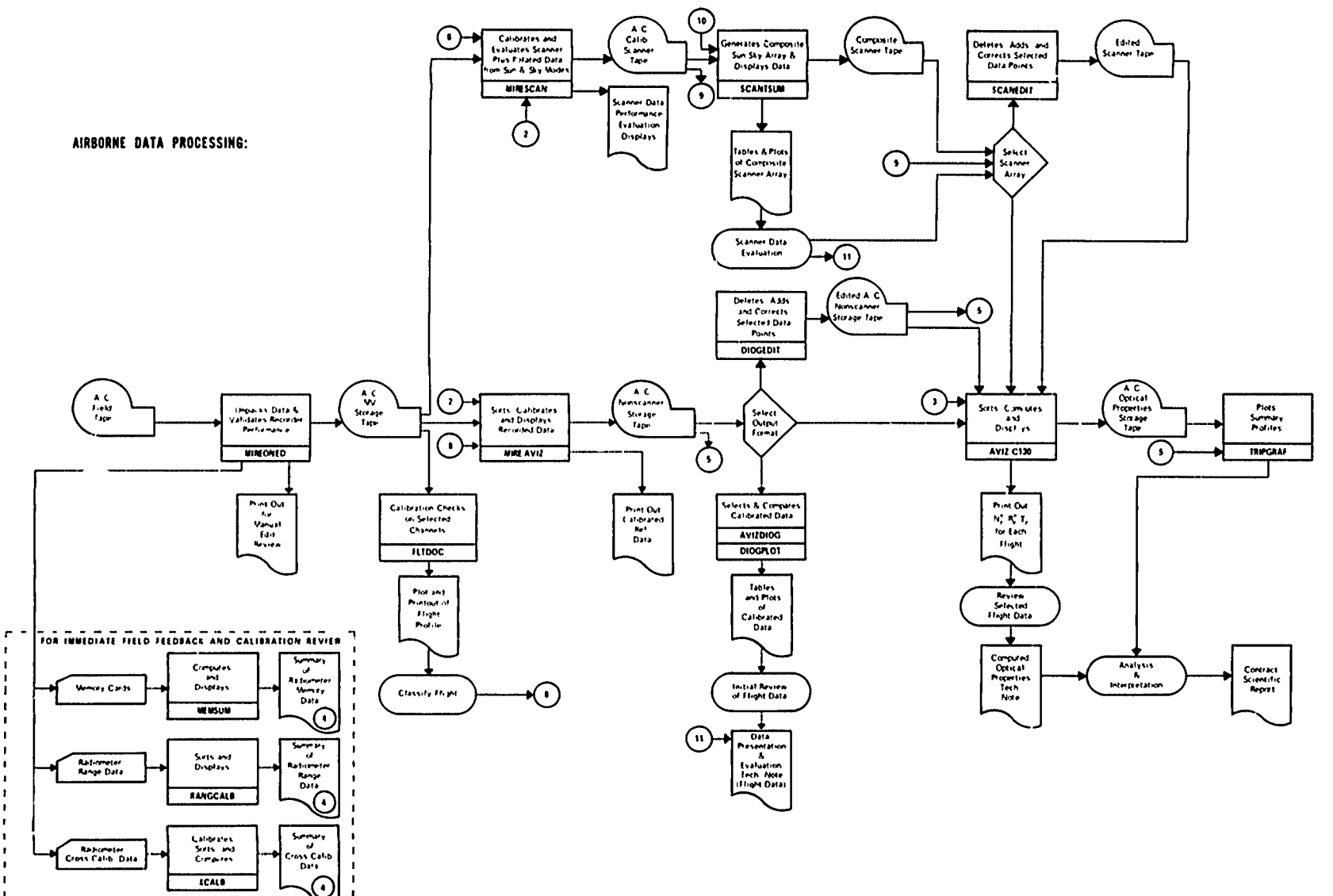


Fig 5-1 Atmospheric Visibility Program Airborne Data Processing Schedule.

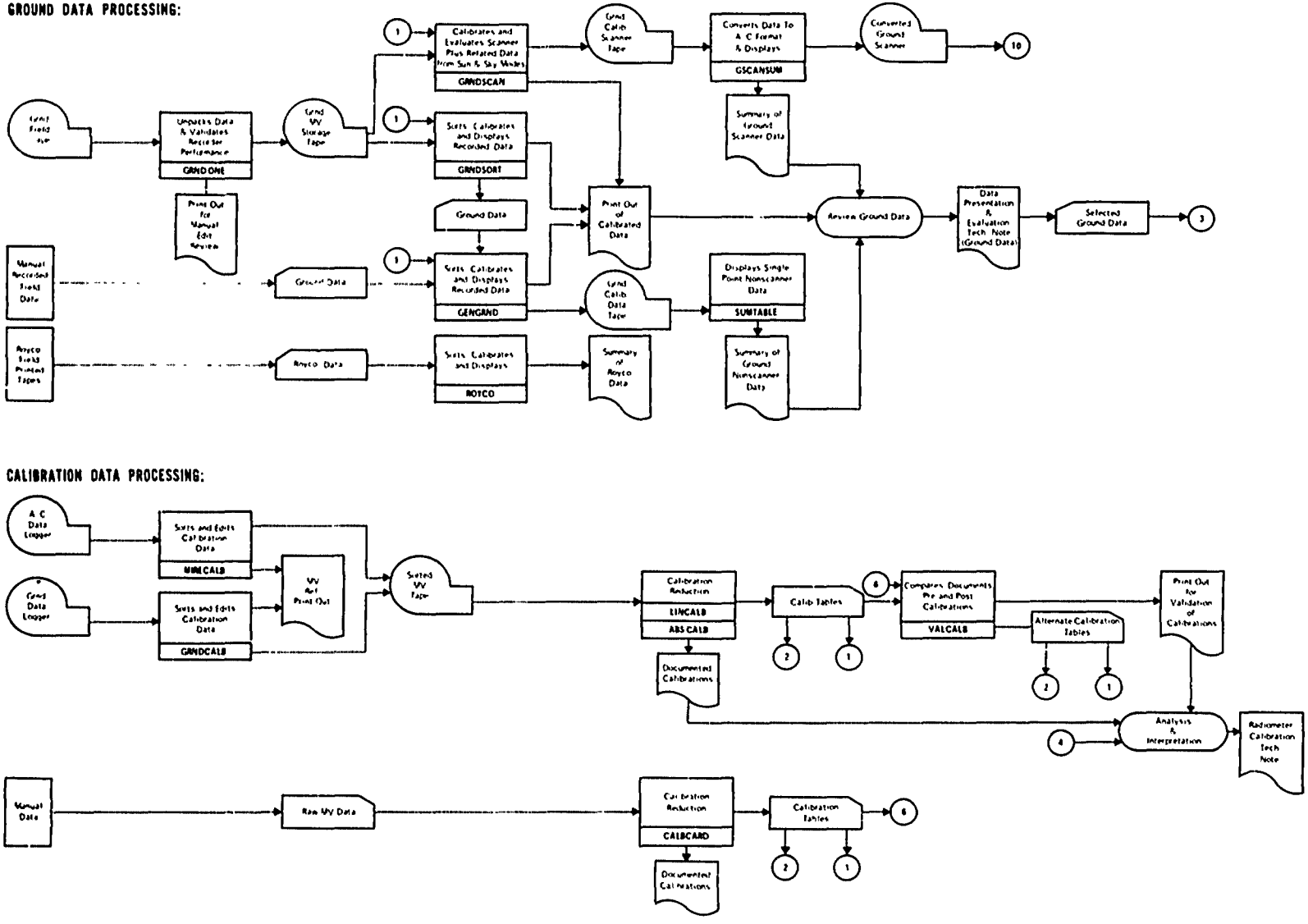


Fig. 5-2. Atmospheric Visibility Program Data Processing Schedule.

5.2. GROUND-BASED DATA

Only the CRM and NEPH systems were used for the collection of ground-based data and their outputs were manually recorded. Due to the relatively small quantities of ground data acquired during OPAQUE V, minimal automatic processing has been required.

5.3. CALIBRATION DATA

The calibration data are the heart of the data processing system in that any data processed are only as good as the calibrations applied to them. The pre- and post-deployment calibration data are recorded on tape in an effort to eliminate the human bias and are handled in a phased procedure similar to that used in the general data processing technique. The data can be recorded on either the airborne or the ground data logging system. In an initial procedure, these data go through Program MIRECALB or GRNDCALB, according to the recording system used, to verify the electrical quality of the radiometer data and associated monitored parameters. For final processing, the data are sorted and stored in set fashion.

The details of processing the calibration data according to the procedure illustrated in Fig. 5-2 are described in our preceding reports, AFCRL-72-0593, Duntley, *et al.* (1972c), AFCRL-TR-75-0414, Duntley, *et al.* (1975a) and AFCRL-TR-75-0457, Duntley, *et al.* (1975b), and will not therefore be discussed further herein.

5.4. DATA TAPES

The data processing sequences referenced in the previous paragraphs produce output tapes containing a broad catalog of calibrated data. These tapes are useable as data inputs to a multiplicity of diverse problems requiring a knowledge of atmospheric optical properties. To simplify future retrieval, the data tape numbers, and the in-house descriptions of the data reported herein have been summarized in Table 5.1.

Table 5.1. Data Library Composite Tape Summary

OPAQUE V Flight No	DIOGEDIT Tape No VL-334K File No	Data Presentation No	Edited Properties No
C-460	1	178	184
C-461	2	178	184
C-462	3	178	184
C-463	4	178	184
C-464	5	179	185
C-465	6	179	185
C-466	7	179	185
C-467	8	179	185
C-468	9	179	185
C-469	10	179	185
C-471	11	180	186
C-472	12	180	186
C-473	13	180	186
C-474	14	180	186
C-475	15	181	187
C-476	16	181	187
C-477	17	181	187
C-478	18	181	187
C-479	19	181	187

6. WEATHER SUMMARY

6.1. INTRODUCTION AND GRAPHICS

Meteorological data available for analysis were provided by the Environmental Technical Applications Center (ETAC) at Scott Air Force Base. These data included daily surface and 500-millibar charts, surface observations, pilot reports, satellite photographs, vertical cross sections, and radiosonde data. Northern hemisphere surface charts for 0000 GMT and 1200 GMT and 500-millibar charts for 1200 GMT prepared by the National Oceanographic and Atmospheric Administration were obtained from the National Climatic Center in Asheville. Portions of the 1200 GMT surface charts have been reproduced as Fig. 6-1. The approximate flight track locations are indicated in Fig. 6-1 with the character ★ A later section includes tabular data of the hourly observations from stations in the vicinity of the flight track.

Airborne measurements of temperature and computed values of relative humidity, as derived from these measurements and simultaneous measurements of dewpoint temperature, are presented in Fig. 6-2 and 6-3. The temperatures were measured continuously by an AN/AMQ-17 aerograph system described briefly in AFCRL-70-0137, Duntley, *et al.* (1970a) and more completely in USNAF TP-133. The dewpoint/frostpoint temperatures were measured using a Cambridge 137-C3 Aircraft Hygrometer System which is described briefly in AFCRL-72-0593, Duntley, *et al.* (1972c).

The profile identification symbols used in Figs. 6-2 and 6-3 are related to the spectral filter sequence during which the data were measured; i.e., the temperature profile identified with the Filter 2 symbol was taken during the same time interval as the Filter 2 radiometric measurements; the temperatures coded as Filter 3 were taken simultaneously with the Filter 3 radiometric measurements, etc. Table 6-1, abstracted from program FLTDOC listings, summarizes the beginning and ending times associated with each flight element during which these meteorological and radiometric measurements were made. The time separations between profiles are substantial and should be carefully considered when assessing the temporal stability of the subject airmass.

Radiosonde observations for 1200 GMT were available from sites near each of the flight tracks. At some locations radiosonde data for 0000 GMT and/or 0600 GMT were also available. The temperatures from the radiosonde station closest in time and location to each flight track have been plotted on the temperature plots in Fig. 6-2. The relative humidities, computed from RAOB temperature and dewpoint depression measurements are also shown on the plots in Fig. 6-3. The locations of the radiosonde stations are shown on the data site detail maps in Fig. 1-1. More detailed location information as well as the station identification code used in Fig. 6-2 and 6-3 is included in Table 6.2. Although the RAOB data are graphed with the C-130 data, it should be remembered that the two data sets are often remote in either space or time. Weather and traffic conditions often induce three to four miles of variability in the location of each day's flight track. Thus only approximate track-RAOB geographical separations are indicated in the flight descriptions of Section 7.3 and in Table 6.2. The time separations may be determined by comparing the flight times noted in Tables 6.1 and 7.3 with the RAOB release time noted in Table 6.2. One should also note that RAOB data points are associated

with altitudes above sea level (MSL) whereas the data in Figs. 6-2 and 6-3 are plotted against approximate altitude above ground level (AGL). The merging of these two data sets will occasionally result in RAOB data points appearing as if they were measured at ground level, particularly at sites such as Birkhof where the terrain along the track is relatively high and irregular in ground elevation.

During each of the flights an on-board meteorologist made and recorded observations concerning the cloud and haze conditions, shadows, visibility of the solar disc, and slant path visibilities from various altitudes. Some of these observations are included in the tables in the flight descriptions in Section 7.3. These in-flight observations have been very useful in evaluating and confirming the data recorded by the airborne instrument systems.

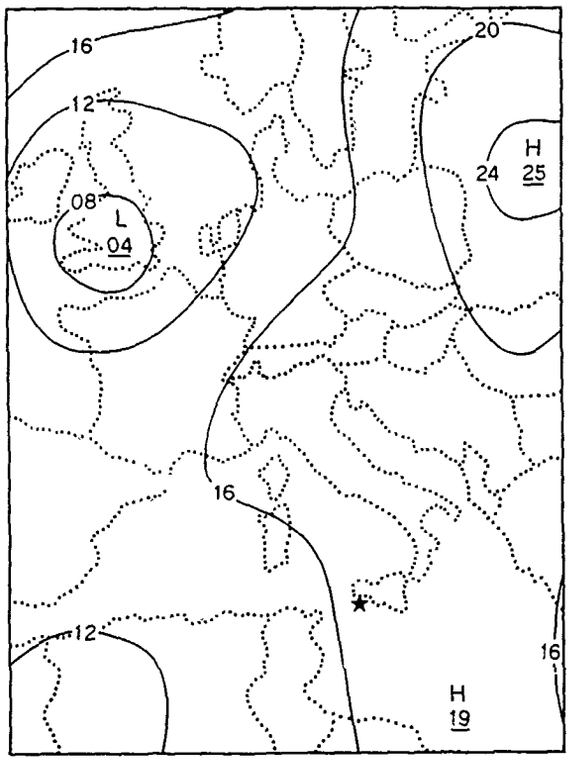
The daily flight descriptions which appear in Section 7.3 also include a discussion of the weather characteristics and a summary of the synoptic situation at the surface and 500-millibar levels during each flight. The synoptic conditions are detailed in Section 6.2 which also includes a description of conditions derived from satellite photographs and computer printouts of weather conditions and visibilities less than 5 nautical miles (9 km) over western Europe.

Table 6.1. Flight Profile Elapsed Time Summary (GMT)

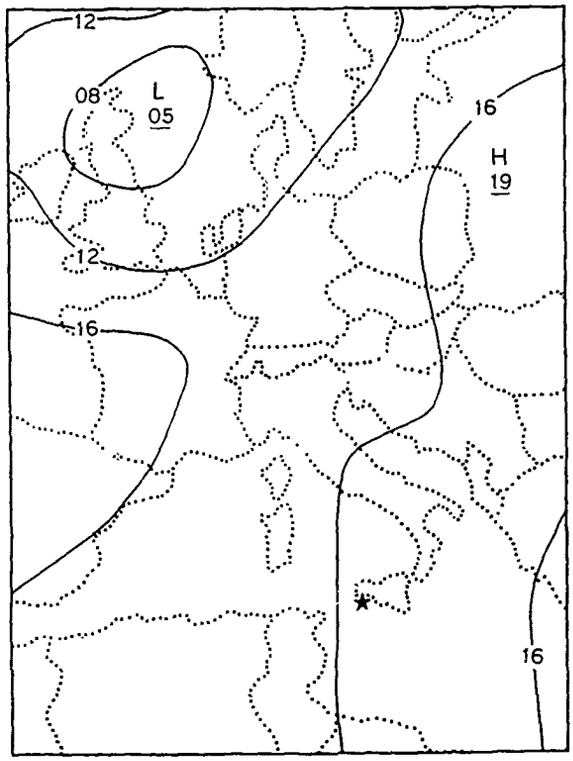
Flight No	Date (1978)	Profile Flight Times (GMT)								Total Time Elapsed (V-PRO Only)	
		Filter 2		Filter 3		Filter 4		Filter 5			
		Start	Stop	Start	Stop	Start	Stop	Start	Stop	Hours	Minutes
C-460	2 AUG	1202	1314	1332	1346	1404	1439	1448	1501	2	59
C-461	3 AUG	919	1009	1025	1037	1056	1129	1157	1206	2	47
C-462	5 AUG	907	1010	1031	1043	1103	1207	1223	1240	3	33
C-463	7 AUG	942	1042	1056	1110	1130	1227	1243	1256	3	14
C-464	14 AUG	1213	1219	1233	1238	1257	1302	1318	1322	1	09
C-465	14 AUG	1412	1416	1430	1434	1449	1454	1507	1510		58
C-466	15 AUG	933	1029	1044	1056	1117	1222	1248	1303	3	30
C-467	18 AUG	1132	1229	1246	1257	1315	1407	1424	1435	3	03
C-468	21 AUG	933	1030	1044	1058	1116	1213	1230	1244	3	11
C-469	22 AUG	1211	1310	1325	1337	1355	1455	1513	1527	3	16
C-471	11 SEP	753	755	810	812	829	831	847	850		57
C-472	11 SEP	1240	1320	1328	1342	1400	1433	1443	1457	2	17
C-473	11 SEP	1523	1525	1539	1541	1557	1559	1619	1623	1	00
C-474	13 SEP	927	1029	1048	1100	1117	1232	1248	1301	3	34
C-475	15 SEP	1315	1423	1443	1458	1519	1623	1639	1652	3	37
C-476	16 SEP	1105	1220	1239	1255	1316	1418	1437	1451	3	46
C-477	18 SEP	1116	1144	1202	1211	1236	1305	1325	1334	2	18
C-478	25 SEP	1348	1439	1451	1505	1514	1548	1601	1615	2	27
C-479	26 SEP	939	1027	1055	1105	1123	1217	1242	1251	3	12

Table 6.2. Radiosonde Station Identification RAOB data time is 1200 GMT

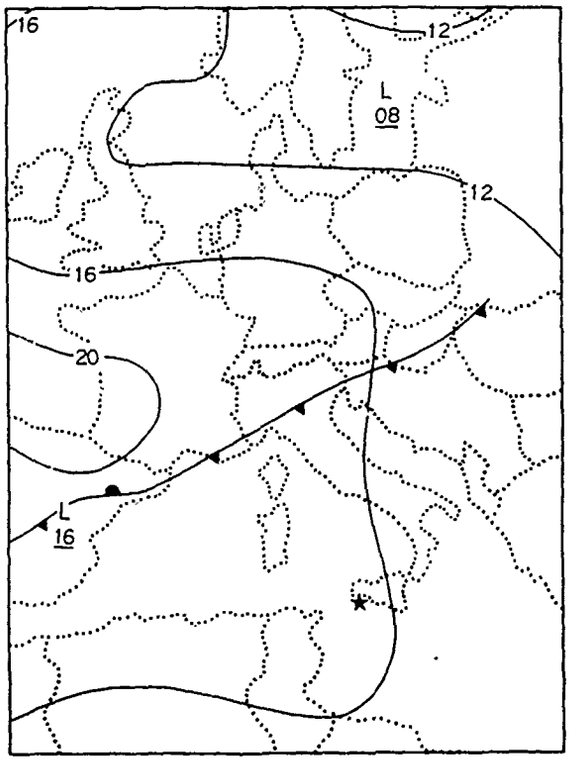
Flight Nos	Track Identification	Radiosonde Station					
		Location Raob Station	Latitude	Longitude	El(m)	Range & Direction from Track Center	Fig 6-1 and 6-2 Identification Code
460,461,462,463	Trapani	Fiumicino	41°48'N	12°15'E	2	473 Km NE	RAOB F
464,467,469	[illegible]terberg	DeBilt	52°06'N	05°12'E	2	32.1 Km NW	RAOB D
465,466,468	Meppen	Bergen	52°49'N	09°57'E	68	149 Km E	RAOB B
471,472,473,474	Birkhof	Neuchatel	46°49'N	06°58'E	501	225 Km SW	RAOB N
475,476,477	Yeovilton	Crawley	51°05'N	00°13'W	144	160 Km E	RAOB C
478,479	Rodby	Schleswig	54°32'N	09°57'E	48	103 Km W	RAOB S



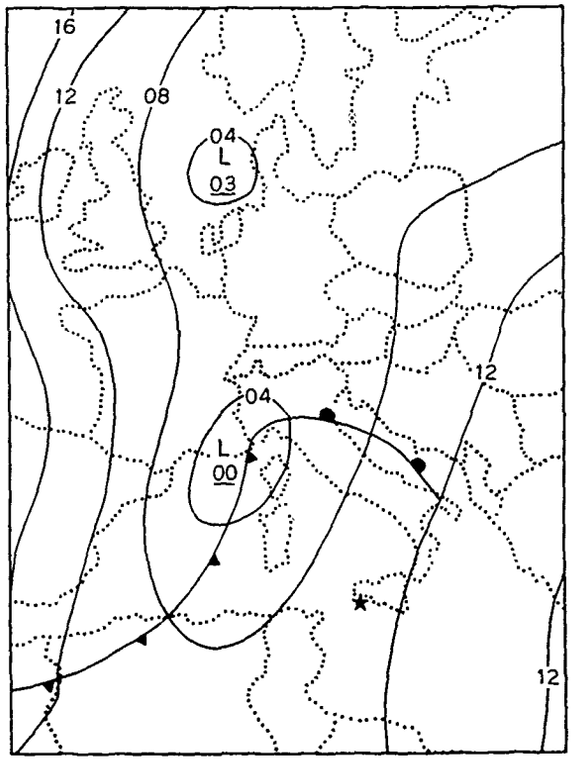
C-460 2 AUG 1978 1200 GMT



C-461 3 AUG 1978 1200 GMT



C-462 5 AUG 1978 1200 GMT



C-463 7 AUG 1978 1200 GMT

Fig. 6-1a Surface Synoptic Charts of European Area During Project OPAQUE V

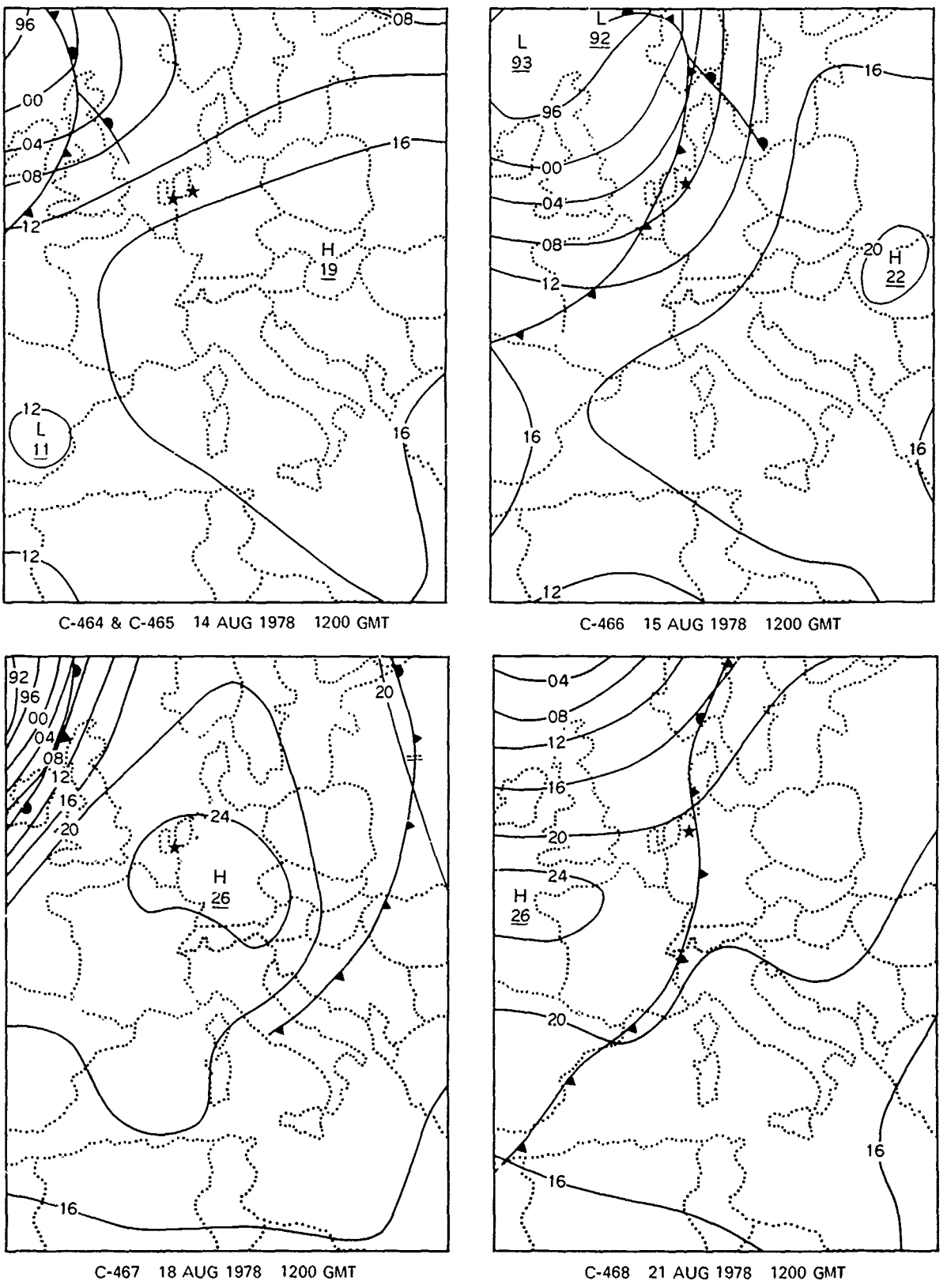
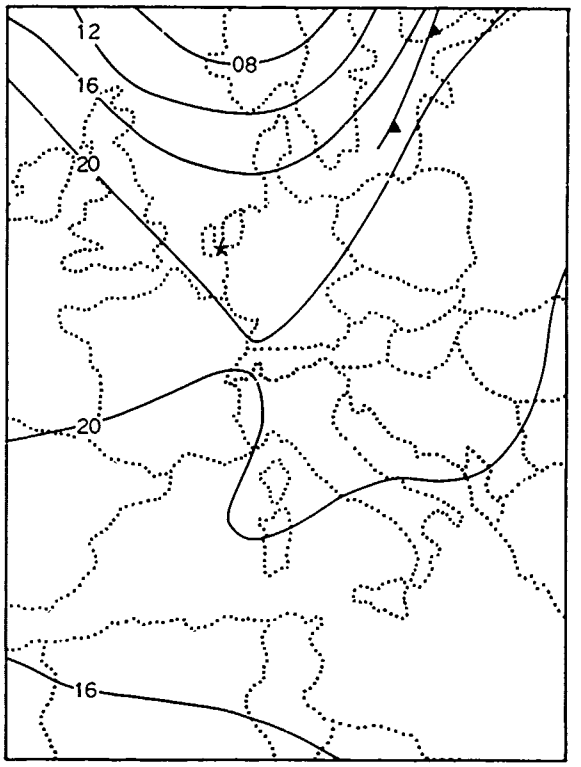
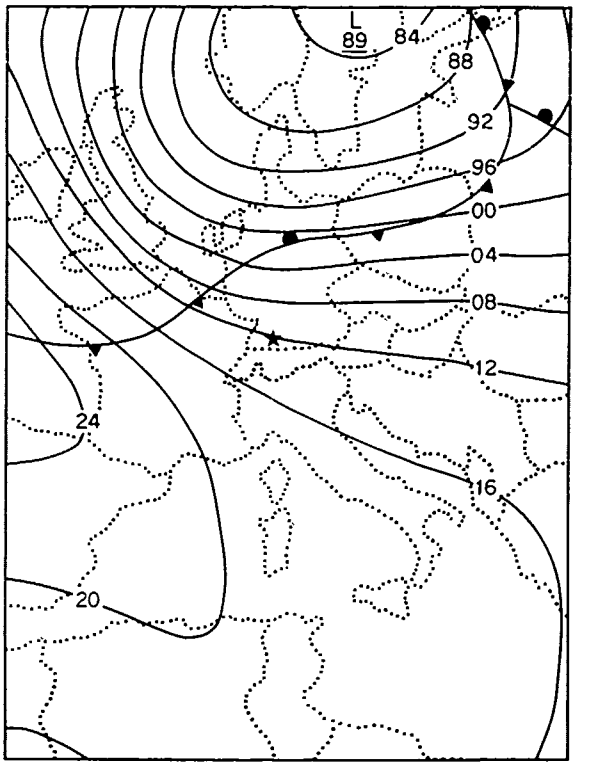


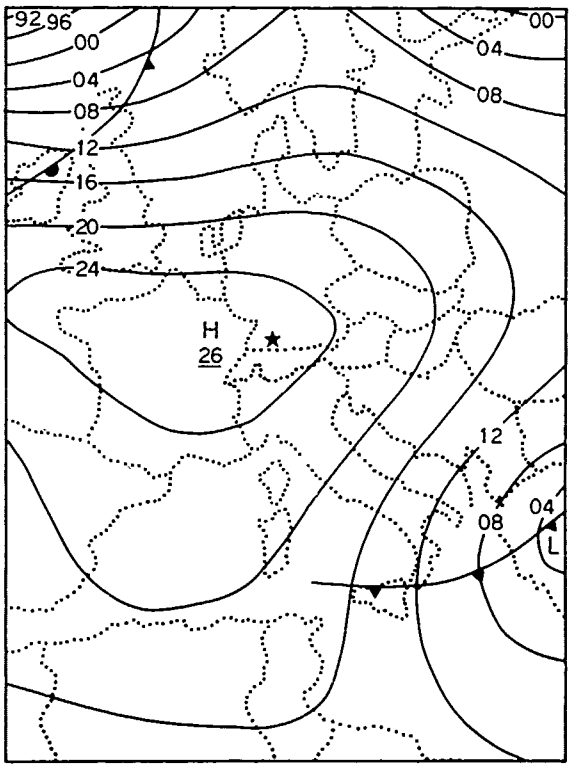
Fig 6-1b Surface Synoptic Charts of European Area During Project OPAQUE V



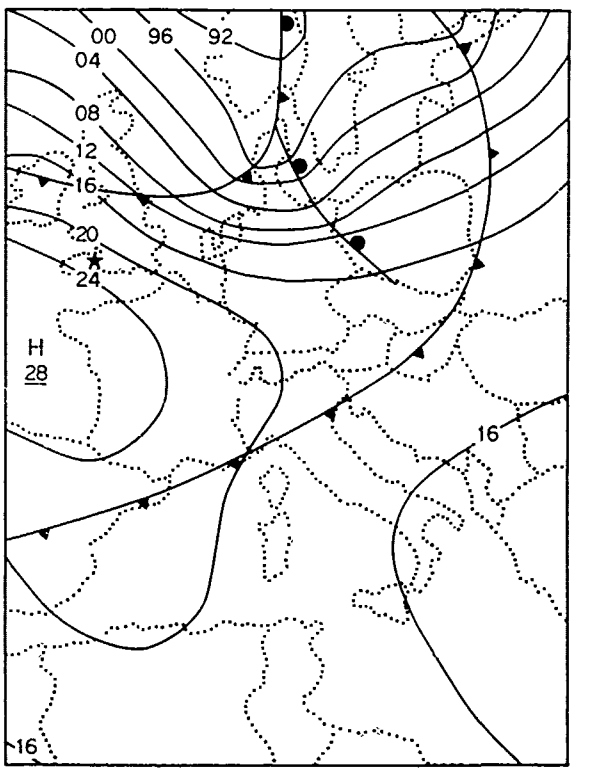
C-469 22 AUG 1978 1200 GMT



C-471, 472, & 473 11 SEPT 1978 1200 GMT

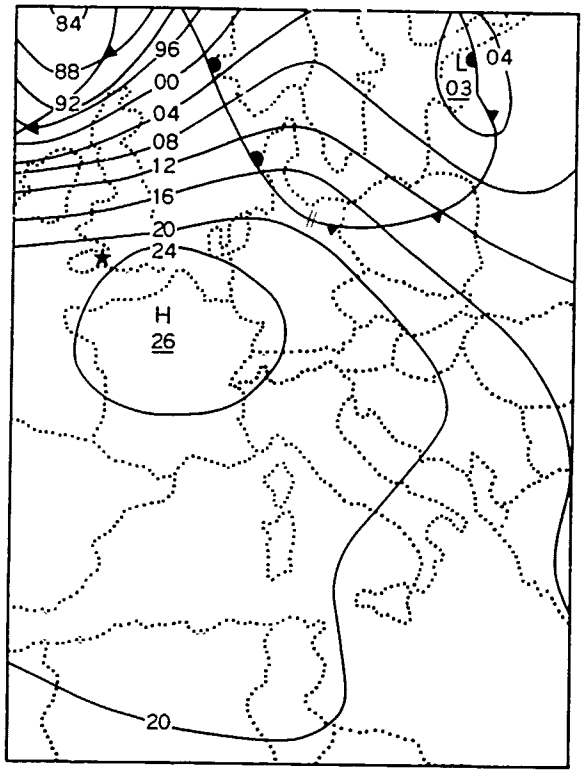


C-474 13 SEPT 1978 1200 GMT

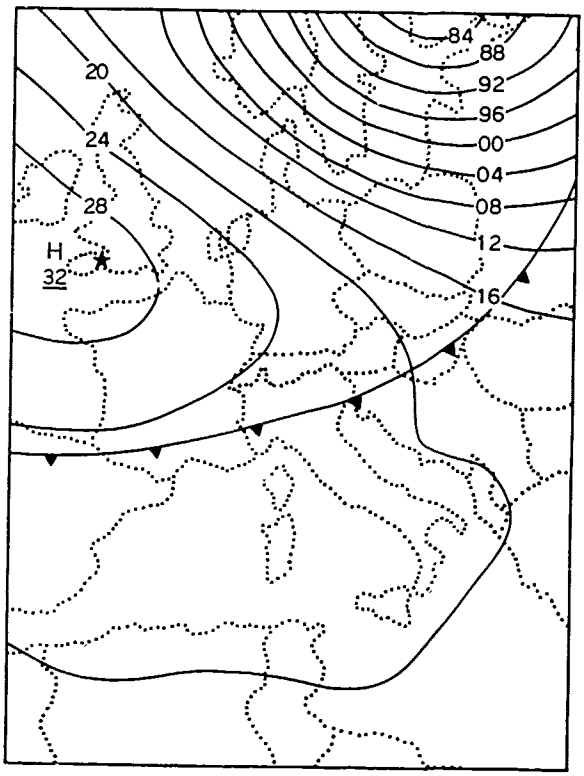


C-475 15 SEPT 1978 1200 GMT

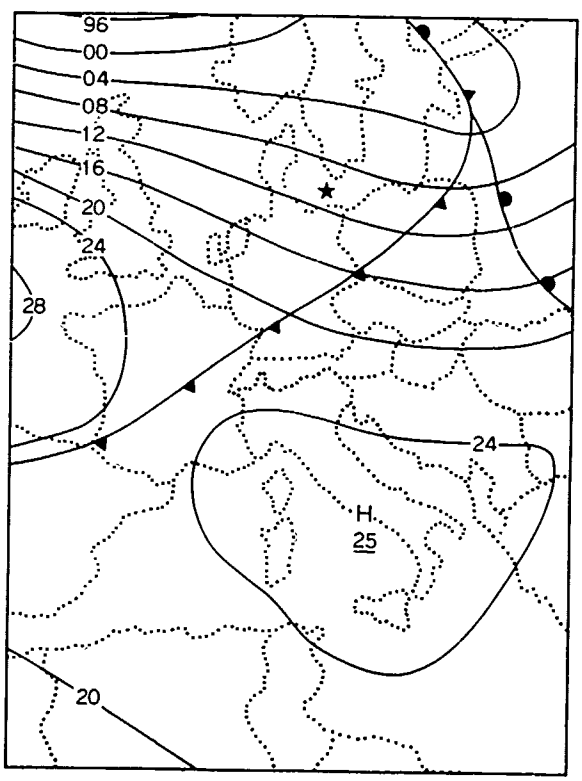
Fig 6-1c Surface Synoptic Charts of European Area During Project OPAQUE V



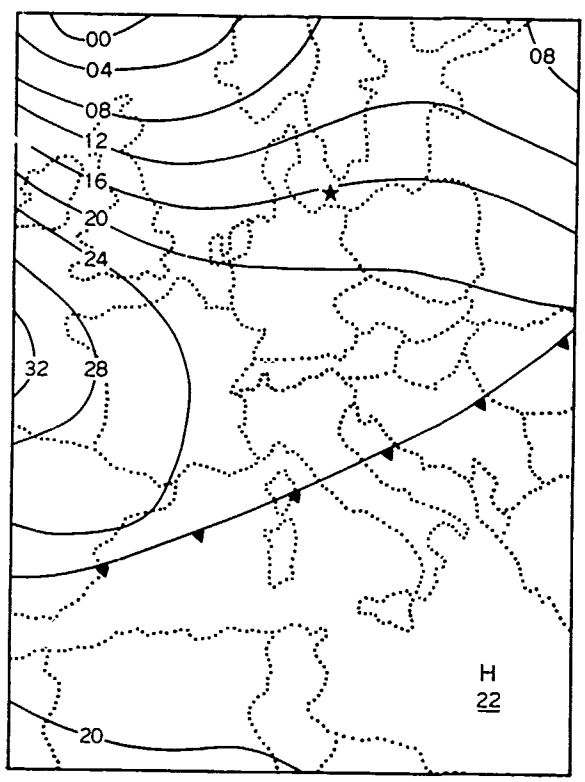
C-476 16 SEPT 1978 1200 GMT



C-477 18 SEPT 1978 1200 GMT



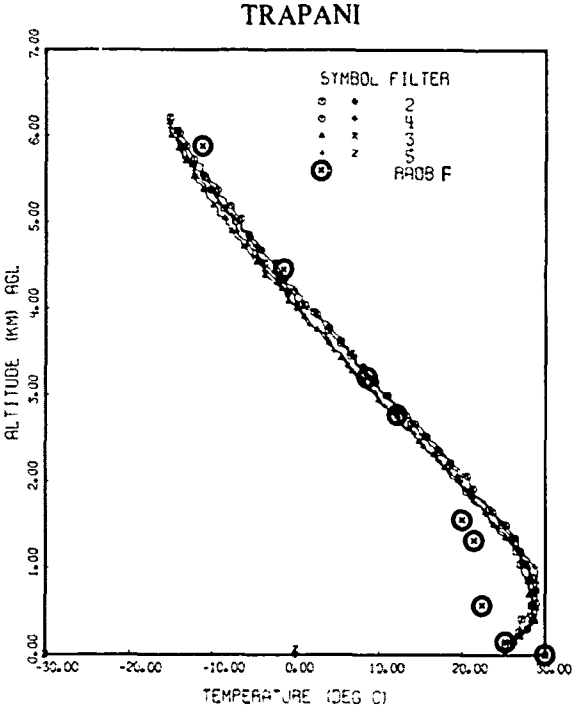
C-478 25 SEPT 1978 1200 GMT



C-479 26 SEPT 1978 1200 GMT

Fig 6-1d Surface Synoptic Charts of European Area During Project OPAQUE V

FLIGHT C-460
TRAPANI



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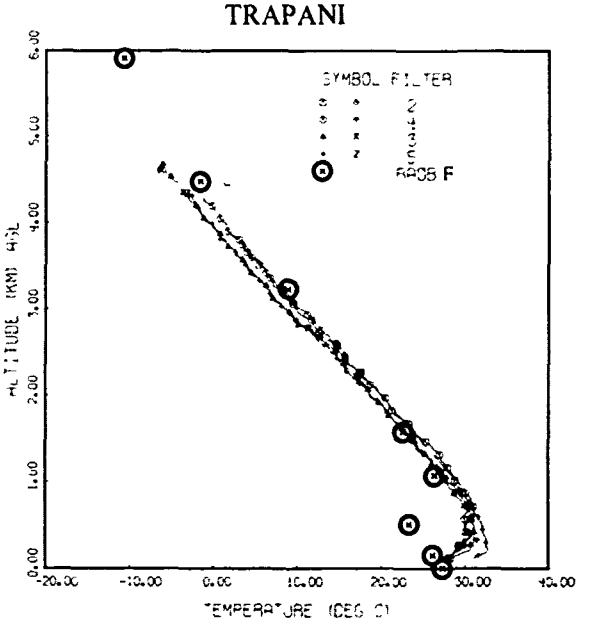

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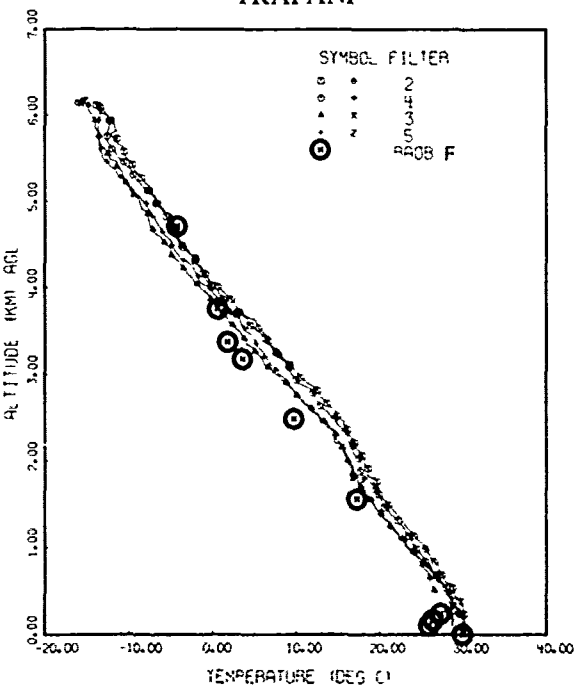


FLIGHT C-463
SIGONELLA

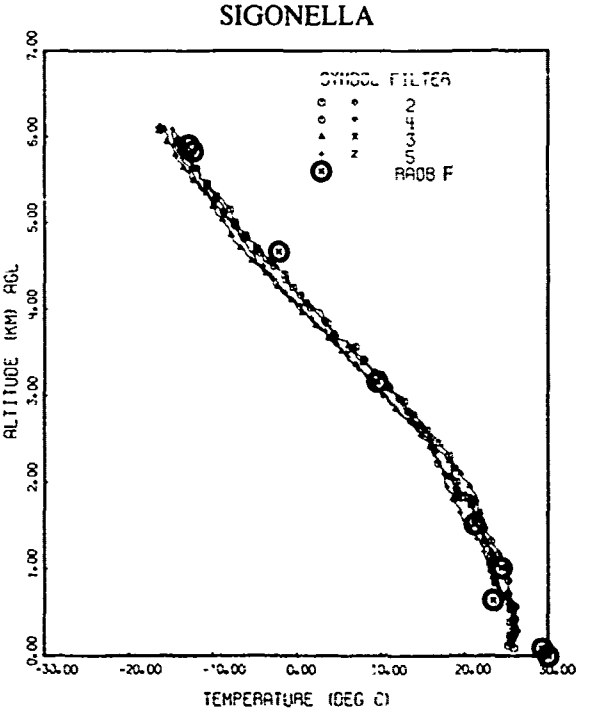
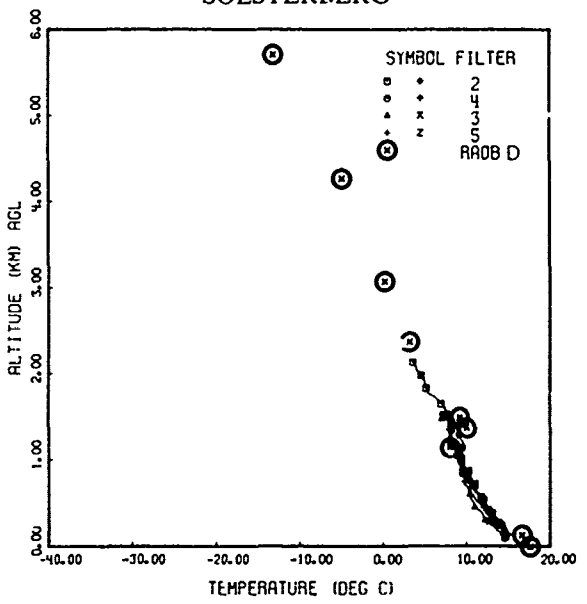
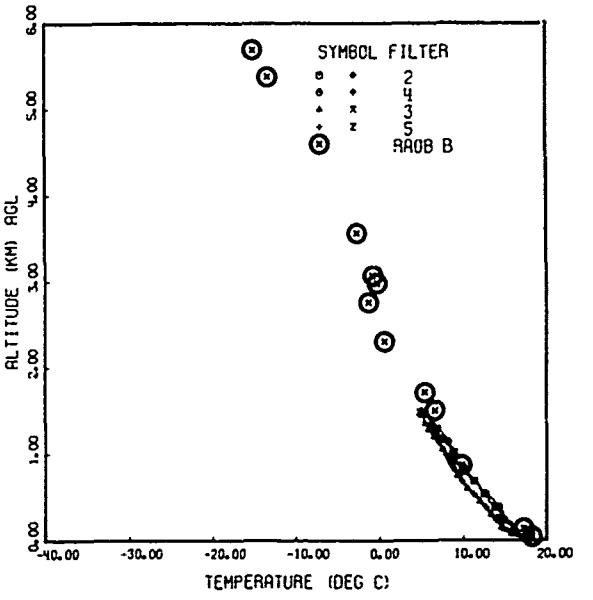


Fig. 6-2a Temperature Versus Altitude for 19 Project OPAQUE V Flights

FLIGHT C-464
SOESTERBERG



FLIGHT C-465
MEPPEN



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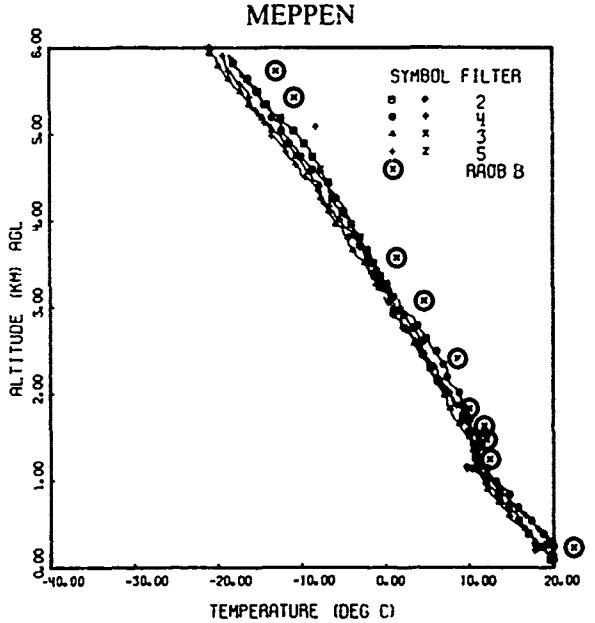

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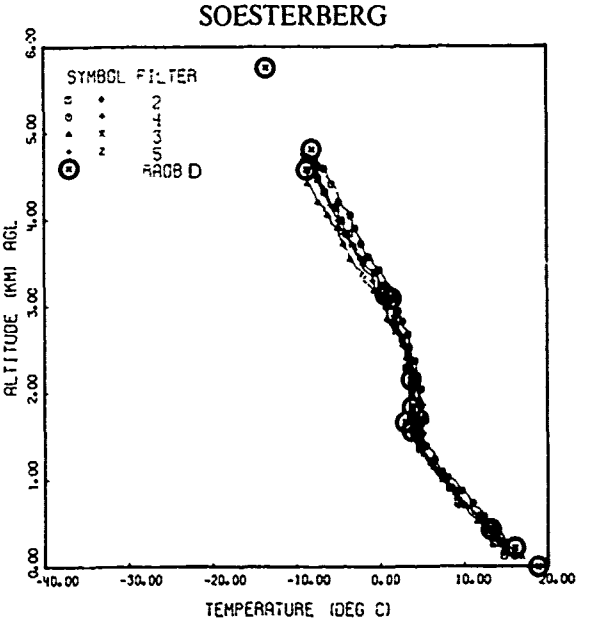
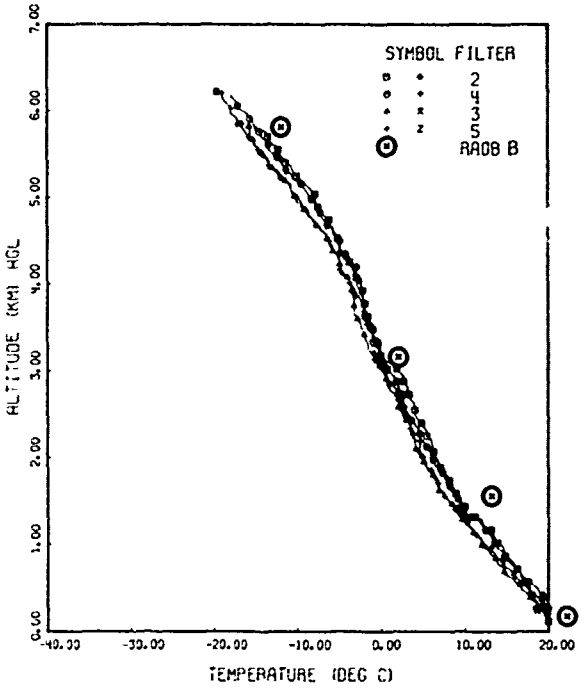


Fig 6-2b Temperature Versus Altitude for 19 Project OPAQUE V Flights

FLIGHT C-468
MEPPEN



FLIGHT C-469
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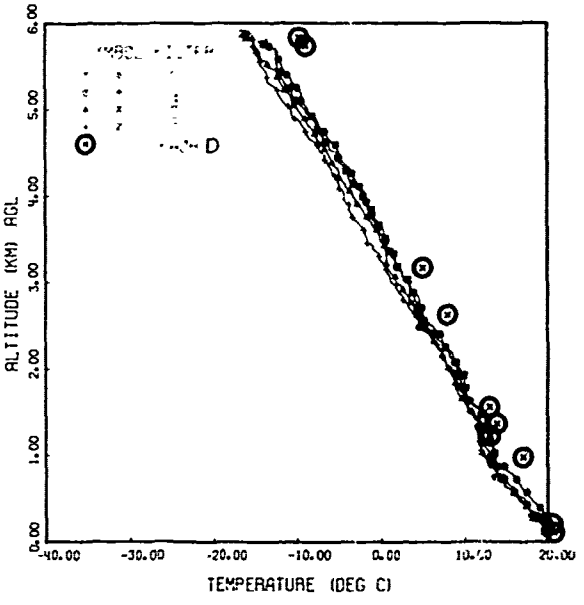
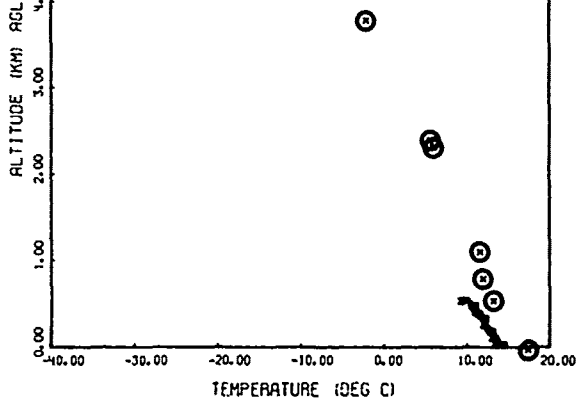


FLIGHT C-471
BIRKHOF



FLIGHT C-472
BIRKHOF

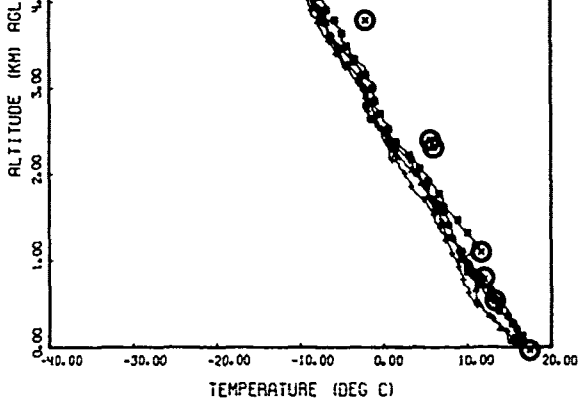
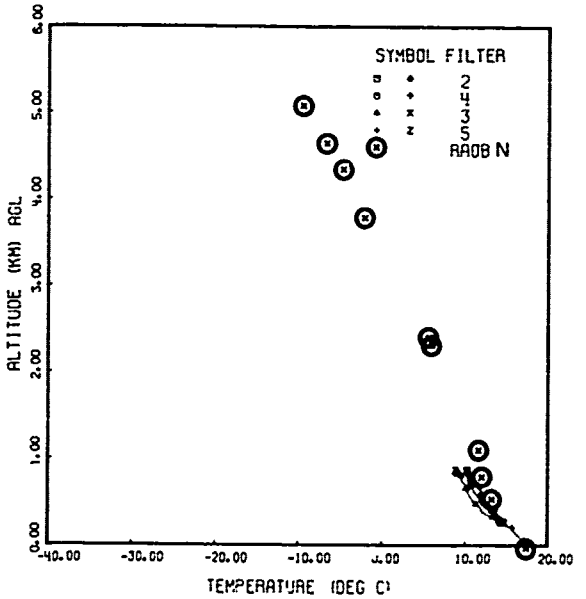
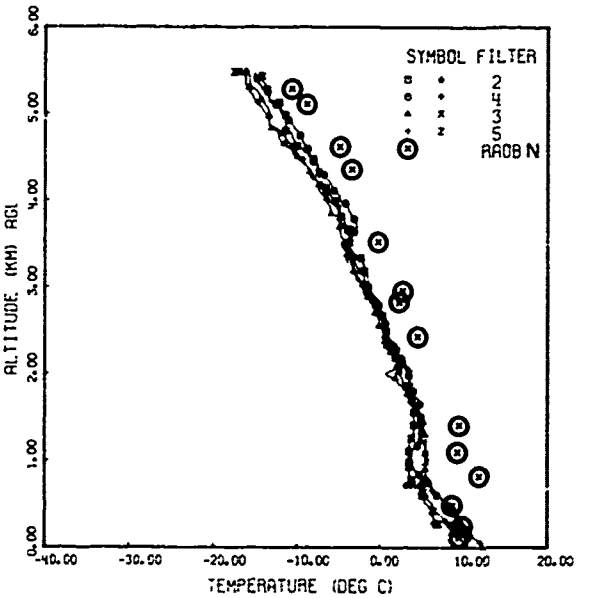


Fig. 6-2c Temperature Versus Altitude for 19 Project OPAQUE V Flights

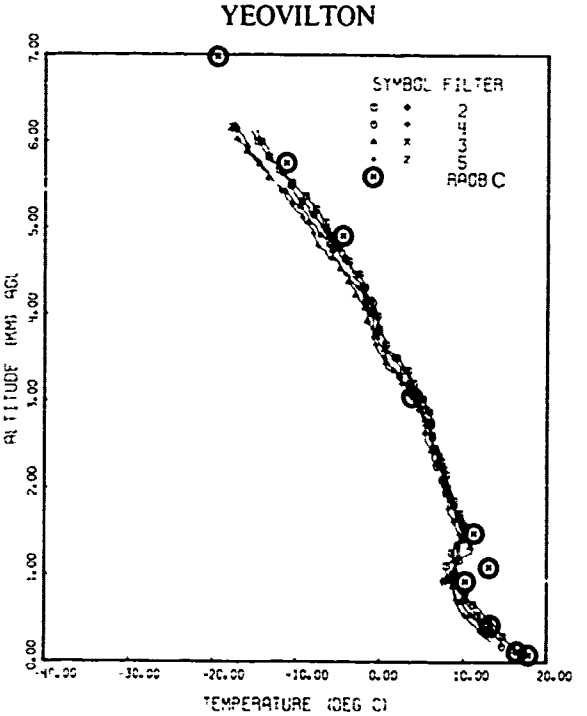
FLIGHT C-473
BIRKHOF



FLIGHT C-744
BIRKHOF



FLIGHT C-475
YEOVILTON



FLIGHT C-476
YEOVILTON

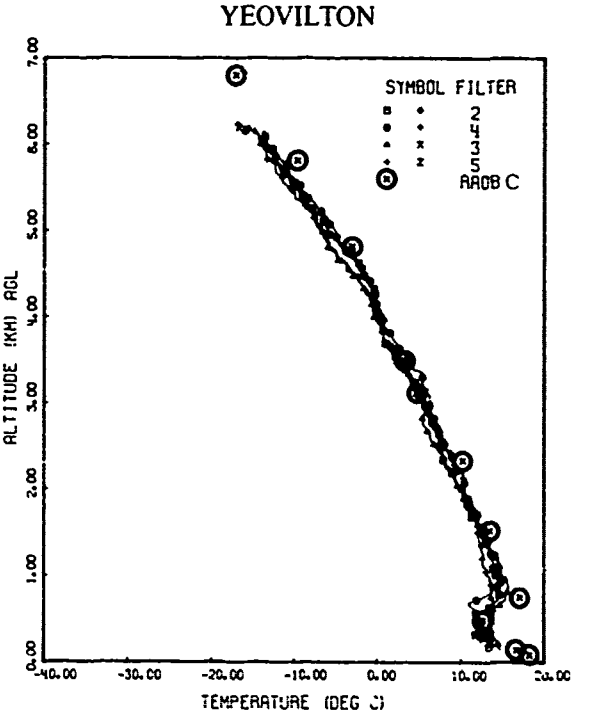
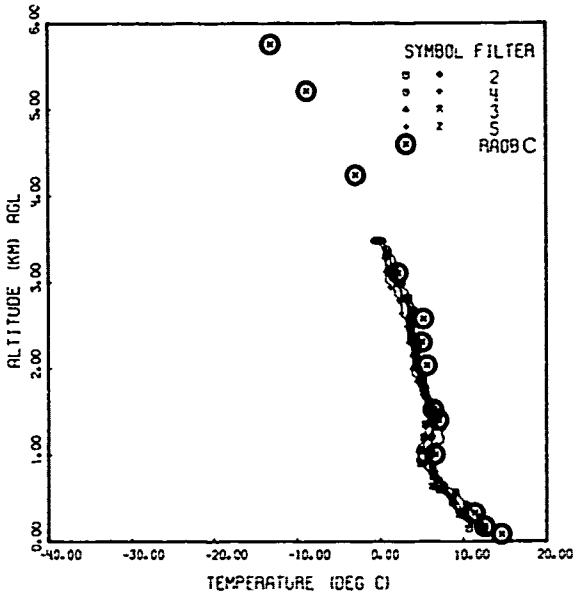
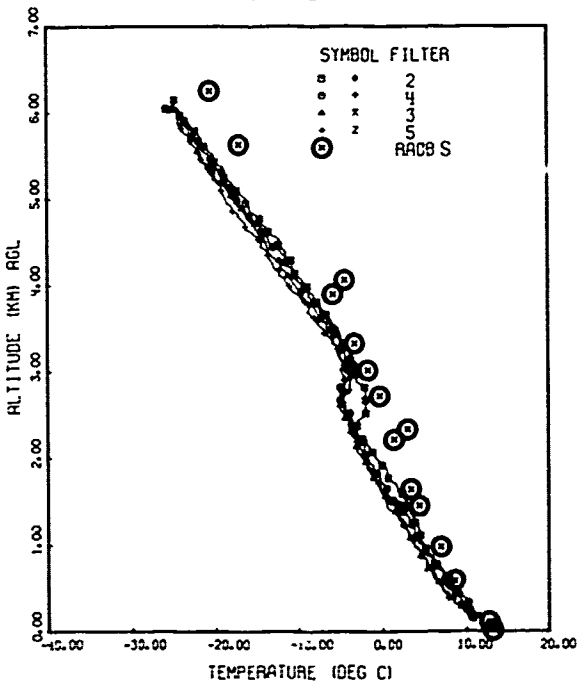


Fig 6-2d. Temperature Versus Altitude for 19 Project OPAQUE V Flights

FLIGHT C-477
YEOVILTON



FLIGHT C-478
RODBY



FLIGHT C-479
RODBY

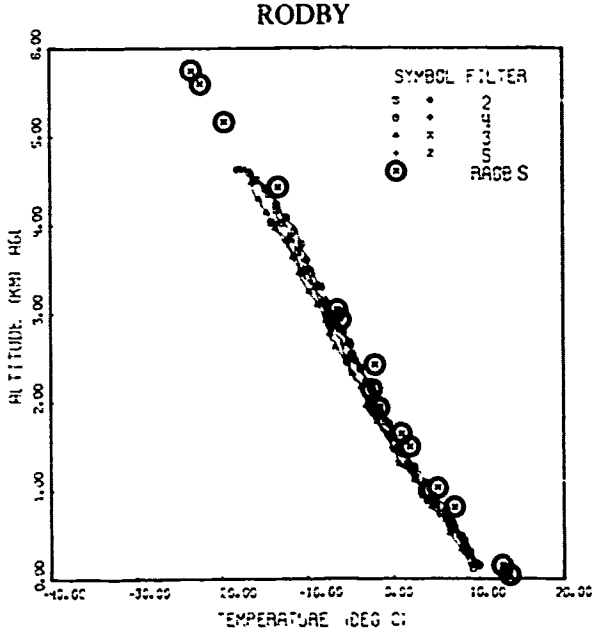
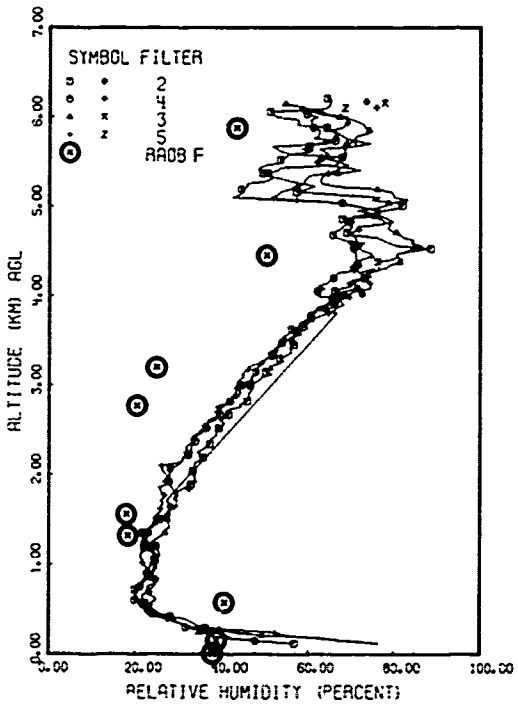
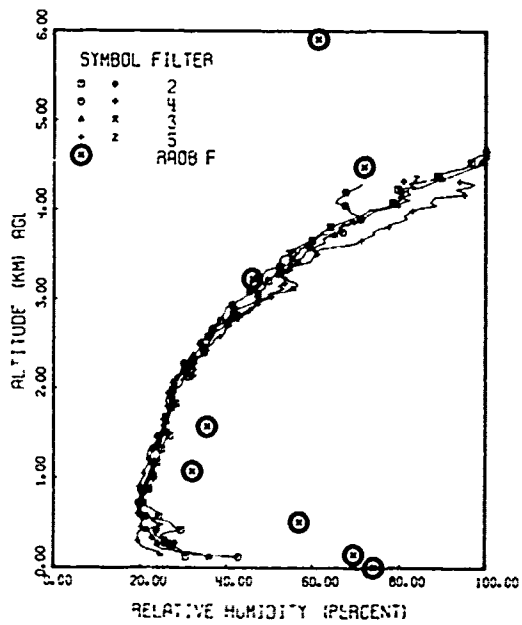


Fig. 6-2e Temperature Versus Altitude for 18 Project OPAQUE V Flights

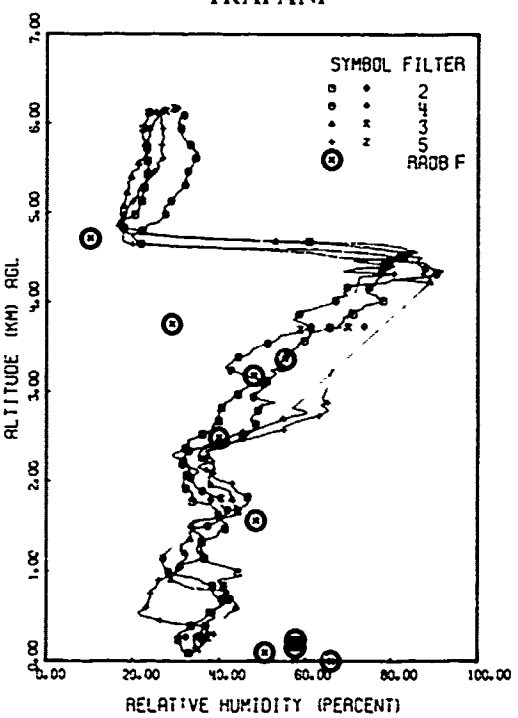
FLIGHT C-460
TRAPANI



FLIGHT C-461
TRAPANI



FLIGHT C-462
TRAPANI



FLIGHT C-463
TRAPANI

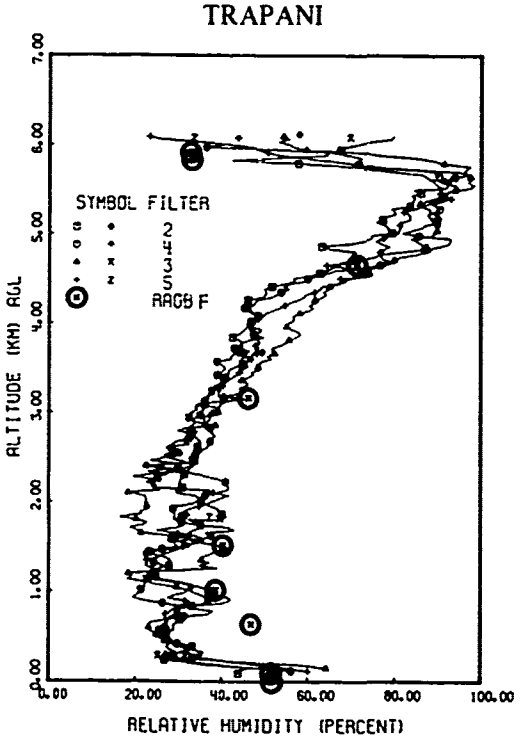
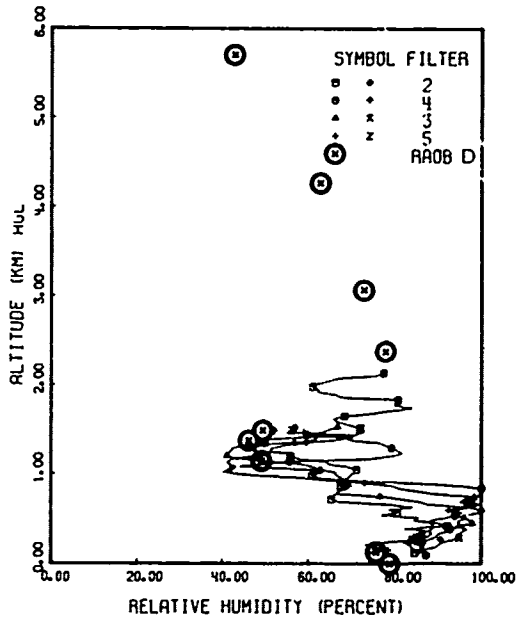
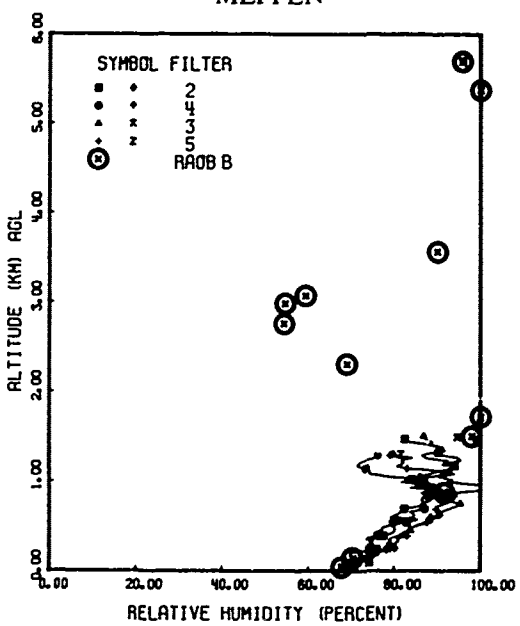


Fig. 6-3a Relative Humidity Versus Altitude for 19 Project OPAQUE V Flights

FLIGHT C-464
SOESTERBERG



FLIGHT C-465
MEPPEN



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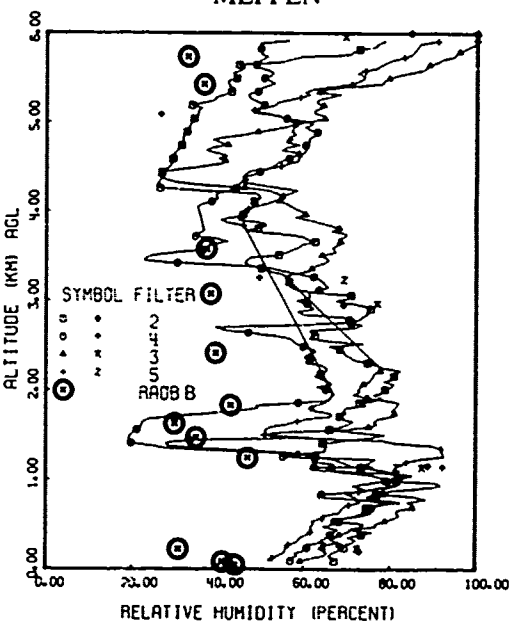

FLIGHT C-467
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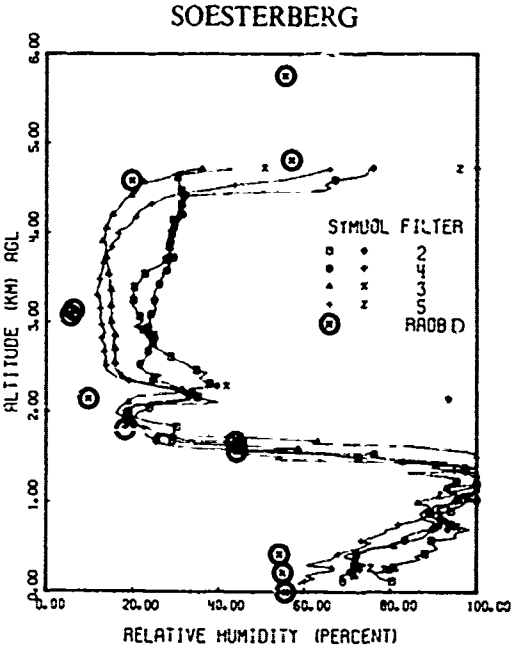
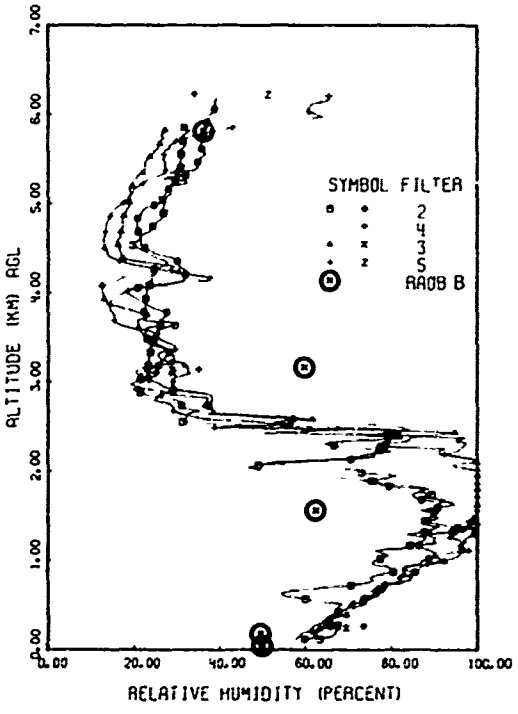
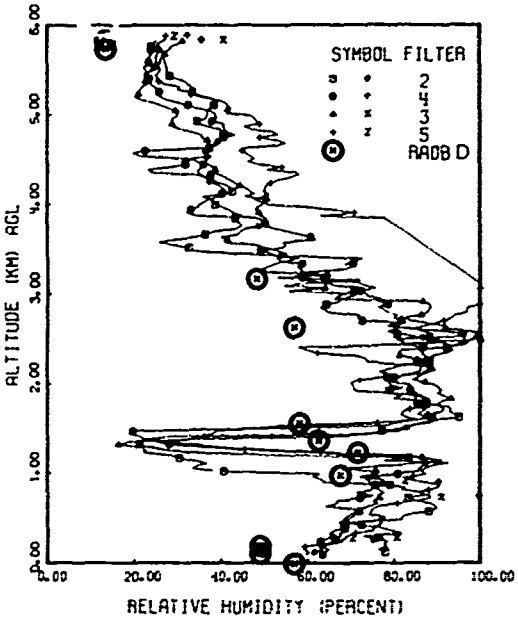


Fig 6-3b Relative Humidity Versus Altitude for 19 Project OPAQUE V Flights

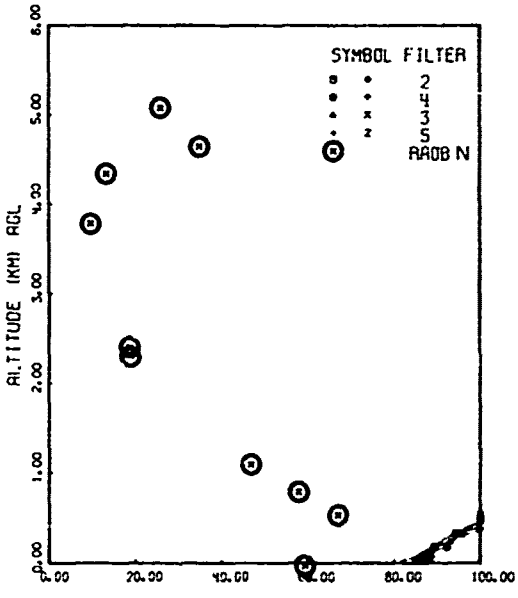
FLIGHT C-468
MEPPEN



FLIGHT C-469
SOESTERBERG



FLIGHT C-471
BIRKHOF



FLIGHT C-472
BIRKHOF

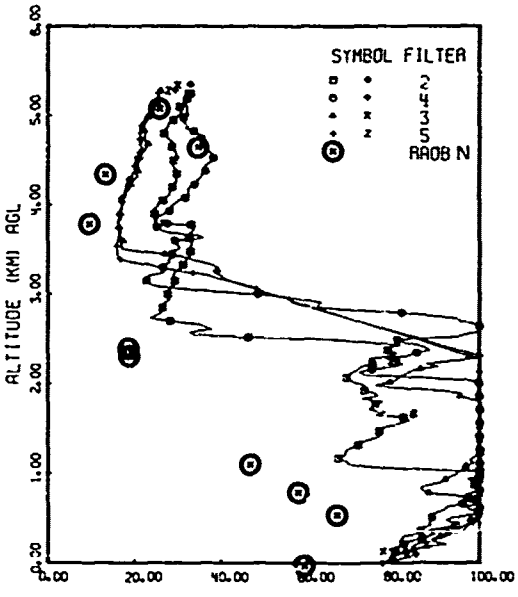
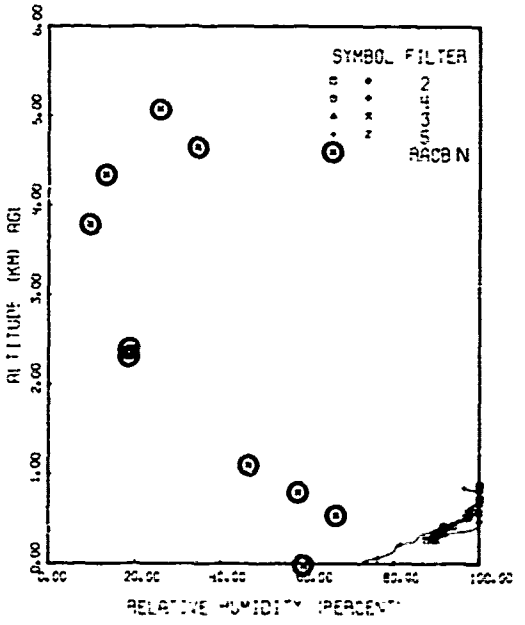
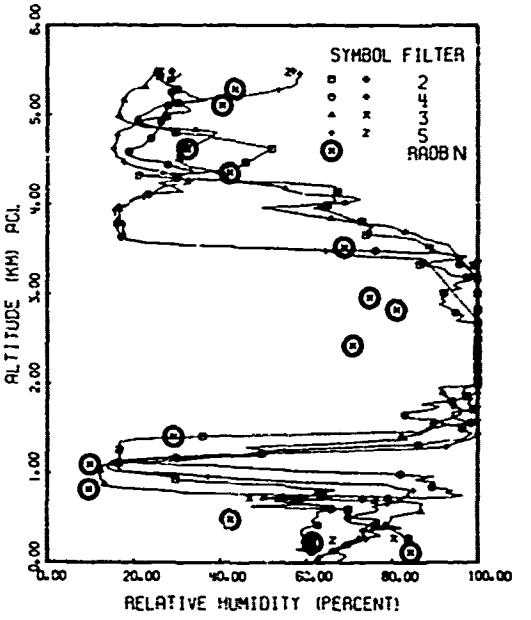


Fig 6-3c Relative Humidity Versus Altitude for 19 Project OPAQUE V Flights

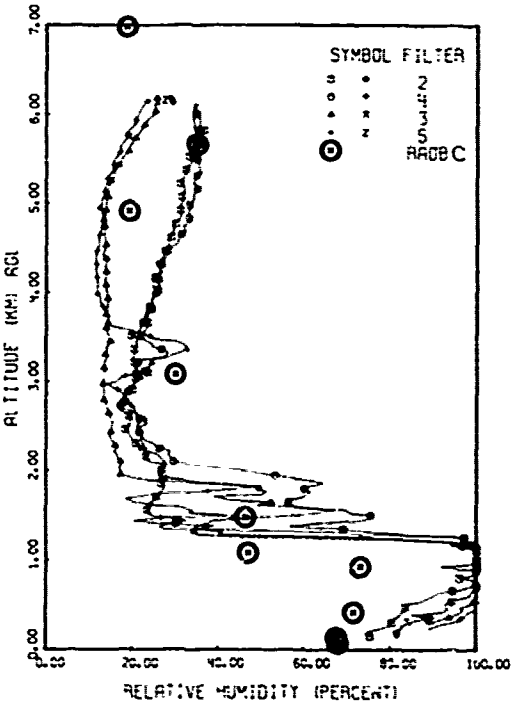
FLIGHT C-473
BIRKHOF



FLIGHT C-474
BIRKHOF



FLIGHT C-475
YEOVILTON



FLIGHT C-476
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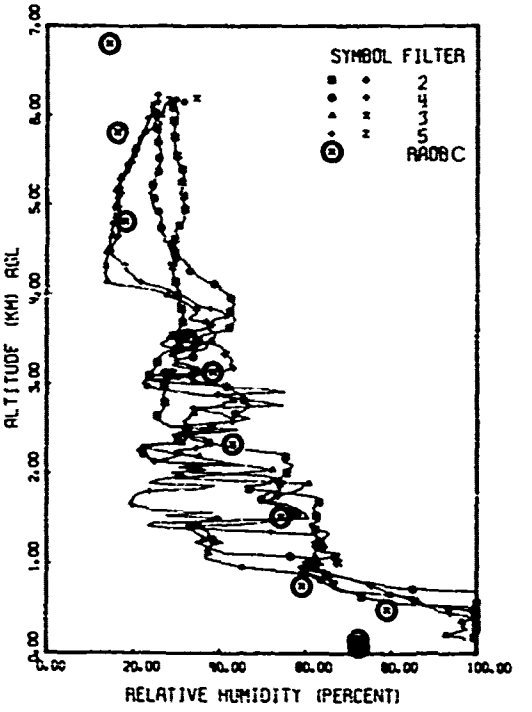
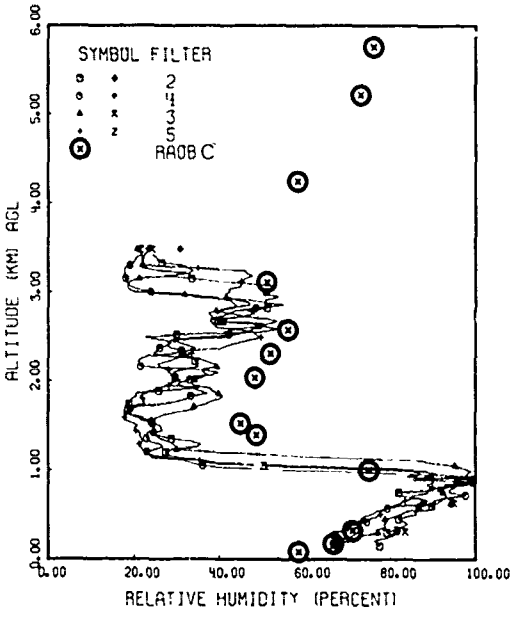
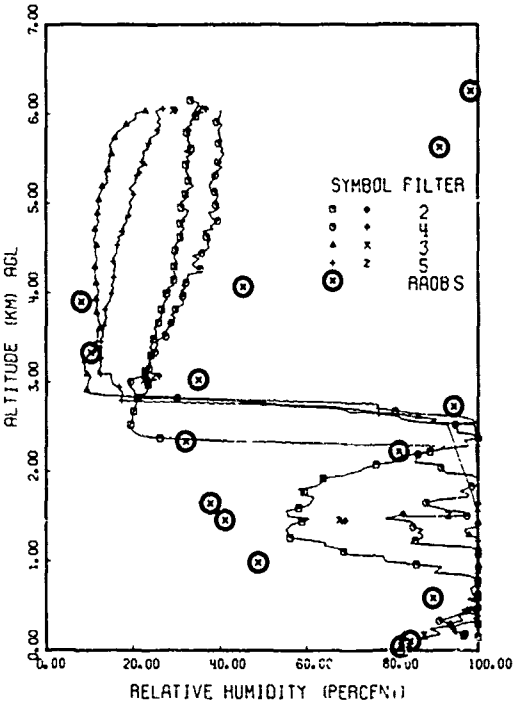


Fig. 6-3d Relative Humidity Versus Altitude for 19 Project OPAQUE V Flights

FLIGHT C-477
YEOVILTON



FLIGHT C-478
RODBY



FLIGHT C-479
RODBY

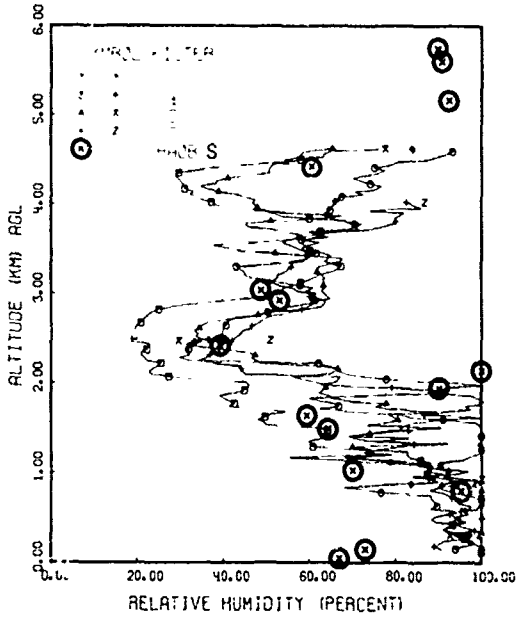


Fig 6-3e Relative Humidity Versus Altitude for 19 Project OPAQUE V Flights

6.2. SYNOPTIC CONDITIONS

FLIGHT C-460 ON 2 AUGUST 1978

The 0000 GMT surface chart showed a frontal system 15° west of Ireland. There was a 1004 millibar low in southern Great Britain. There was another low over northwestern Africa. A high pressure area centered near 53°N 32°E had a ridge southsouthwest to Sicily. There was generally weak gradient over western Europe with no frontal activity. At 1200 GMT the gradient remained very weak over western Europe and the low centered over southern Great Britain was filling. The frontal system was 10° west of Ireland and there was little change in the high pressure area. Ridging continued over Sicily and Italy. The pressure gradient over Sicily was weak with light surface winds. At 500 millibars a ridge of high pressure enveloped North Africa and the southern Mediterranean with the track in moderate westerly flow. There was also a closed low over southeastern England at 0000 GMT. By 1200 GMT there was a closed high over Sicily, Tunisia and northern Libya with moderate westerly flow over the track. The satellite maps indicated that both Sicily and Italy were experiencing clear skies. The computer printouts for both 0900 and 1200 GMT showed clear skies and 10 kilometer visibility. The air mass was maritime polar.

FLIGHT C-461 ON 3 AUGUST 1978

The 0000 GMT surface chart showed a very weak gradient over Sicily and the entire area of western Europe. A 1005 millibar low in the southern portion of the North Sea was filling slowly. A 1023 millibar high over Russia was centered at 53°N 31°E. The frontal system that was 5° west of the Irish coast was weakening. At 1200 GMT a very weak gradient covered western Europe. There was a weak high oriented northnortheast to southsouthwest from western Russia through Sicily to Libya Sicily and the track had a light and variable surface flow of wind. The 500 millibar chart for 0000 GMT showed a closed high centered in the Mediterranean and encompassing Sicily Winds were light and variable over the track. At 1200 GMT the closed high continued over the central Mediterranean Wind flow over the track was light to moderate westerly. The air mass was maritime polar. The satellite maps for 1259 and 1309 GMT showed thin clouds over the track and over most of Europe except for Spain and Portugal. The computer printed maps showed broken altocumulus at 10000 feet and high cirrus over western Sicily.

FLIGHT C-462 ON 5 AUGUST 1978

The surface chart for 0000 GMT showed ground fog over Sicily with a very light pressure gradient. A weak cold front extended from Lithuania southwest to Poland, to central Spain and into the eastern Atlantic. By 1200 GMT the cold front had started to weaken and extended from central Poland southwest through the tip of Portugal with a wave in northeastern Spain. There was a weak gradient over Sicily with the surface flow light northerly. The air mass was maritime polar. At 500 millibars at 0000 GMT there was high pressure over northern Africa with a center in western Algeria. Flow over Sicily and the track was moderate northwesterly. By 1200 GMT the high was centered near 30°N 8°E

and there was moderate westnorthwesterly flow over the track. The satellite map for 1309 GMT showed clear skies over Sicily as did the computer printouts. The air mass was modified maritime polar.

FLIGHT C-463 ON 7 AUGUST 1978

The 0000 GMT surface chart had a stationary front from Salerno, between Corsica and Sardinia, into the central east coast of Spain then southwestward to Cadiz and into the Atlantic. A weak high pressure cell extended from western Russia southsouthwest to Libya with Sicily in the southwestern quadrant. At 1200 GMT there was a 1000 millibar low centered near Genoa with a warm front east and southeast to the Adriatic Sea. A cold front, part of the same system, extended southwest from Genoa through the western Mediterranean to Morocco. The cold front was 7.5 degrees west of Trapani. Surface flow over Sicily was southerly. The 500 millibar chart for 0000 GMT showed ridging from northwestern Africa that extended northeast through Sicily to Germany. There was troughing from the North Sea southwest to Portugal. At 1200 GMT there was a closed high in Tunisia and ridging northnortheast to Poland. There was troughing from the North Sea to Hispania and moderate northwesterly winds over the track. The air mass was maritime polar. The satellite map for 1309 GMT showed clouds over most of Europe with Sicily in a small clear area. The computer printouts for 0900 GMT showed Sicily in the clear, with scattered altocumulus and cirrus at 1200 GMT.

FLIGHT C-464 ON 14 AUGUST 1978

The surface chart for 0000 GMT indicated a weak ridge of the Atlantic High extended through northern France and southern Germany. There was an occluded front that extended from south of Iceland southeastward to northern Ireland then south and southwest as a cold front through western Ireland into the Atlantic. A warm front, part of this same system, extended from northern Ireland southward into the Irish Sea. There was also a 1016 millibar low centered in the northern Adriatic. At 1200 GMT there was a high centered near Berlin with the 1016 millibar isobar enclosing most of continental Europe. An occluded front extended from south of Iceland southeastward to Scotland, then as a cold front southward through the eastern Irish Sea into the Atlantic. The warm front part of this system extended from Scotland southeastward to the North Sea. There was light westerly surface flow over the track. The 500 millibar chart for 0000 GMT had ridging from the Bay of Biscay to Scotland with the track on the leading side with moderate northwesterly winds. At 1200 GMT there was ridging from Algeria northward through the North Sea. The track had moderate westnorthwesterly winds at this level. The air mass was maritime polar. The satellite map was difficult to define with clouds over most of Europe except for southern France, Sardinia and Sicily. The computer printout maps showed broken to overcast cumulus, stratocumulus, altocumulus and cirrus over the area.

FLIGHT C-465 ON 14 AUGUST 1978

The surface chart for 0000 GMT indicated a weak ridge of the Atlantic High extended through northern France and southern Germany. There was an occluded front that extended from south of Iceland southeastward to northern Ireland then south and southwest as a cold front through western Ire-

land into the Atlantic. A warm front, part of this same system, extended from northern Ireland southward into the Irish Sea. There was also a 1016 millibar low centered in the northern Adriatic. At 1200 GMT there was a high centered near Berlin with the 1016 millibar isobar enclosing most of continental Europe. An occluded front extended from south of Iceland southeastward to Scotland, then as a cold front southward through the eastern Irish Sea into the Atlantic. The warm front part of this system extended from Scotland southeastward to the North Sea. There was light westerly surface flow over the track. The 500 millibar chart for 0000 GMT had ridging from the Bay of Biscay to Scotland with the track on the leading side with moderate northwesterly winds. At 1200 GMT there was ridging from Algeria northward through the North Sea. The track had moderate westnorthwesterly winds at this level. The air mass was maritime polar. The satellite map was difficult to define with clouds over most of Europe except for southern France, Sardinia and Sicily. The computer printout maps showed broken to overcast cumulus, stratocumulus, altocumulus and cirrus over the area.

FLIGHT C-466 ON 15 AUGUST 1978

The surface chart for 0000 GMT had an occlusion north of Scotland into the North Sea. A cold front extended from the North Sea southsouthwest through Leeds to Plymouth and then southwest into the eastern Atlantic. The warm front part of the system extended southsoutheast from the North Sea to northern Denmark. There was a 1021 millibar high centered in the Ukraine that dominated most of the European continent and western Russia except for a small low in eastern Spain. At 1200 GMT the occlusion in the North Sea with the cold front extending southsouthwest was approaching the coast of The Netherlands and then extended southwest through northwestern France and into the Atlantic. The track was in southwesterly surface flow in advance of the front. At 500 millibars at 0000 GMT there was ridging from Algeria northnortheast to southern Scandinavia. The track had light to moderate northwesterly winds. There was also a closed low west of northern Ireland. By 1200 GMT there was ridging from Tunisia to southern Scandinavia and the low center continued west of northern Ireland. At this level flow over the track was moderate westerly. The air mass was modified maritime polar. The satellite map showed clouds over most of Europe except thin clouds over the low countries and Italy.

FLIGHT C-467 ON 18 AUGUST 1978

The surface chart for 0000 GMT had a high centered near Paris. There was an occluded front 5° west of the Irish coast. The track was in the northeast quadrant of the high with northeasterly surface flow. At 1200 GMT a small 1025 millibar high was centered near Düsseldorf with the track west of the center in light and variable surface flow. An occluded front was approaching the west coast of Ireland with the cold front part of the system extending southsouthwest into the eastern Atlantic. The 500 millibar chart for 0000 GMT had a trough from Sweden southward to Sicily. There was a ridge from France to the Shetland Islands. The track was between these two systems with strong (50 knots) northwesterly flow. At 1200 GMT there was little change except the gradient had weakened to moderate northwesterly flow over the track. The air mass was maritime polar. The satellite map for 1309 GMT showed thin clouds over western Europe and heavier cloud cover over eastern Europe.

FLIGHT C-468 ON 21 AUGUST 1978

The surface chart for 0000 GMT showed an occluded front that extended from north of the Arctic Circle southeast and south to near Oslo then as a cold front southsouthwest through the North Sea to Belgium and off the west coast of Morocco with a wave near Madrid. The front was approaching the flight track and there was southwesterly flow over the track. At 1200 GMT the cold front had passed over the track and was on a line from southern Norway, Bremen, Offenbach, Avignon to Fes. There was a weak cell of high pressure centered two degrees west of Brest. Flow over the track was west-southwesterly. At 500 millibars at 0000 GMT there was weak ridging from northern Italy to northern Scandinavia and a closed low just southeast of Iceland. At 1200 GMT there was ridging from Spain northeastward to Latvia. The track had weak northwesterly flow at this level. The air mass was modified maritime polar. The satellite maps for 1259 and 1309 GMT showed thin clouds over all of western Europe and a frontal system approaching Great Britain.

FLIGHT C-469 ON 22 AUGUST 1978

The surface chart for 0000 GMT showed a weakening cold front was east of the track along the Oslo-Rostock-Bamberg line. A weak high pressure cell was centered west of Brest and there was a weak gradient over the track. At 1200 GMT a low centered at 68°N 5°E had a trough southsouthwest over the track area with surface flow light westerly. The weakening cold front continued to move east and was in western Russia. The weak high continued west of Ireland and France. The 500 millibar chart for 0000 GMT showed weak ridging from Spain to the Gulf of Bothnia, with a low centered at 65°N 5°W. At 1200 GMT the low was located at 67.5°N 1°W with troughing southward to the Irish Sea. There was weak ridging from southern France to western Poland. The track had moderate westerly flow at this level. The air mass was maritime polar. The satellite map for 1309 GMT had clear skies or thin scattered clouds over all of western Europe.

FLIGHT C-470 ON 25 AUGUST 1978 (No flight data for this date)

The surface chart for 0000 GMT had no fronts over Europe with a ridge from the Atlantic High predominant. A cold front extended from off the west coast of Norway to the Shetland Islands then west along 60°N. The track was on the southeast quadrant of the high with northwesterly flow. At 1200 GMT the ridge from the Atlantic High dominated Europe. A dissipating cold front extended from the Gulf of Bothnia southwest to Copenhagen and west to Edinburgh. The track was in the southeastern quadrant of the ridge with light northeasterly flow. The 500 millibar chart for 0000 GMT had a weak gradient over western Europe with light northwesterly flow over the track. There was ridging from the Bay of Biscay through Iceland to the Arctic Circle. At 1200 GMT the weak gradient continued with light to moderate northwesterly winds over the track. There was a low centered at 60.5°N 18°E in the Gulf of Bothnia and an open high over the Bay of Biscay. The air mass was modified maritime polar. There was no satellite map for 1309 GMT but the map for 1529 GMT showed Germany with thin scattered clouds.

FLIGHT C-471 ON 11 SEPTEMBER 1978

The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front. The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds. At 1200 GMT there was ridging from eastern Spain to central Poland. The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France.

FLIGHT C-472 ON 11 SEPTEMBER 1978

The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front. The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds. At 1200 GMT there was ridging from eastern Spain to central Poland. The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France.

FLIGHT C-473 ON 11 SEPTEMBER 1978

The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front. The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds. At 1200 GMT there was ridging from eastern Spain to central Poland. The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France.

FLIGHT C-474 ON 13 SEPTEMBER 1978

The surface chart for 0000 GMT showed that high pressure dominated western Europe with a 1030 millibar center located near Brest A dissipating cold front lay across central Bulgaria, southern Yugoslavia, southern Italy and into central Spain. At 1200 GMT the high pressure continued to dominate Europe with the center in northeastern France. The track was in the northeastern quadrant with light northerly winds at the surface. A weakening cold front from western Russia southwest to Sicily continued to move eastward. There was an occluded front through the Irish Sea and as a cold front southwest into the eastern Atlantic. At 500 millibars at 0000 GMT there was a ridge from Spain to Norway. The track had strong (60 knots) northnorthwesterly winds. At 1200 GMT there was a slight weakening of the ridge and winds were moderate to strong northerly over the track. The air mass was modified maritime polar. The satellite map for 1309 GMT showed a clear area over France and Sicily but scattered to broken clouds over all of the rest of western Europe.

FLIGHT C-475 ON 15 SEPTEMBER 1978

The surface chart for 0000 GMT had a high pressure cell centered at 46.5°N 16°W with the track in the northeastern quadrant with westnorthwesterly flow From a low south of Iceland, an occluded front extended eastsoutheast then as a warm front from the triple point to Northern Ireland. The cold front part of the system extended southwest in the Atlantic. By 1200 GMT the occlusion had moved eastward and was located on the border of Norway and Sweden. The cold front part of the system extended from the triple point southwest to the North Sea then westward through Newcastle-on-Tyne to Belfast, into Donegal Bay and the Atlantic where it was stationary. A 1028 millibar high was located 3° west of Brest. The track had light westerly flow with the high center southwest. At 0000 GMT the 500 millibar chart showed zonal westerlies with moderate to strong westnorthwesterly flow over the track. The situation showed little change at 1200 GMT and the strong westnorthwesterly flow continued. The air mass was modified maritime polar. The 1310 GMT satellite map indicated that the cold front was in the English Channel.

FLIGHT C-476 ON 16 SEPTEMBER 1978

The 0000 GMT surface chart indicated that the high cell had moved eastward with the center located near Brest, France. A cold front extended from Kiel westward through Newcastle-on-Tyne and Belfast into the Atlantic. At 1200 GMT the high had continued to move eastward with the center now located near Orleans, France. The track was in the northwestern quadrant of the high with light southwesterly winds. A cold frontal system was approaching the Irish coast. The 500 millibar chart for 0000 GMT showed weak ridging through Spain to Great Britain. The track had moderate to strong northwesterly flow. At 1200 GMT there was weak ridging from northeastern Spain to the North Sea. There was moderate westerly flow over the track at this level. The air mass was modified maritime polar. There were no satellite maps for this day.

FLIGHT C-477 ON 18 SEPTEMBER 1978

The surface chart for 0000 GMT had a cold front from Helsinki through Kaliningrad, Prague, Lyon and into the eastern Atlantic. A 1032 millibar high was located off southwestern Ireland with the track on the leading edge with light and variable surface winds. At 1200 GMT the 1032 millibar high was centered over central Ireland with the track located near the center. Surface flow was light and variable. There was a cold front from the Ukraine westsouthwest through Trieste, Marseilles, northern Spain and into the Atlantic. The 0000 GMT chart for 500 millibars showed a low in northeastern Sweden. There were zonal westerlies over Great Britain with the track in moderate northwesterly flow. At 1200 GMT the westerlies continued over the track and the low was located on the central Finnish coast. The air mass was maritime polar. The satellite map for 1309 GMT indicated scattered clouds over southern Great Britain.

FLIGHT C-478 ON 22 SEPTEMBER 1978

The surface chart for 0000 GMT showed an occlusion that extended southeast to northern Scandinavia, a warm front from Scandinavia southeast to northwestern Russia, a cold front from the Gulf of Bothnia, Copenhagen, into the North Sea and through the English Channel to the Atlantic. At 1200 GMT the chart indicated that the cold front had passed over the track shortly after midnight and was now along a line from central Latvia, Berlin, Dijon, northern Spain and Portugal then west into the Atlantic. The track had westnorthwesterly surface flow. The 500 millibar chart for 0000 GMT had very weak ridging from Spain through western Poland with the track in strong westerly flow. At 1200 GMT there were zonal westerlies with strong (70 knots) westerly flow over the track. The air mass was maritime polar. The satellite map for 1310 GMT indicated a weak front south of the track.

FLIGHT C-479 ON 26 SEPTEMBER 1978

The surface chart for 0000 GMT showed a cold front in western Russia westsouthwest to Krakow, Stuttgart, southwestern France and northwestern Spain. At 1200 GMT the cold front was weakening and moving south and east. It was now located in central Romania, northern Yugoslavia, Corsica, central Spain, southern Portugal and into the Atlantic. The track had moderate westsouthwesterly flow. On the 0000 GMT 500 millibar chart there were zonal westerlies over the track with strong (60 knots) westerly flow. At 1200 GMT there was troughing from east of Iceland to southern France. The track continued to have strong (50 knots) westerly flow. The air mass was maritime polar. There was no satellite map for this day.

6.3. TABULAR SUMMARY AND GLOSSARY

A summary of the daily meteorological observations taken at the weather stations nearest each flight track on the days during which data flights were made is presented in Table 6.3. A glossary of the most often used symbols is also included. All data were reported in Greenwich Civil Time (GCT) which is equivalent to Greenwich Mean Time (GMT), the terminology used in Table 6.3.

METEOROLOGICAL GLOSSARY AND ABBREVIATIONS

SKY AND CEILING

Sky cover symbols are in ascending order. Figures preceding symbols are heights in hundreds of feet above station. Sky cover symbols are:

- O Clear: less than 0.1 sky cover
- ◔ Scattered: 0.1 to less than 0.6 sky cover
- ◑ Broken: 0.6 to 0.9 sky cover
- ● Overcast: more than 0.9 sky cover
- \- Thin (when prefixed), light (when suffixed)
- -- Very light (when suffixed)
- -X Partial obscuration: 0.1 to less than 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)
- X Obscuration: 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)

Letter preceding height of layer identifies ceiling layer and indicates how ceiling height was obtained. Thus:

- A Aircraft
- B Balloon (pilot or ceiling)
- D Estimated height of cirriform clouds on basis of persistency
- E Estimated height of noncirriform clouds
- M Measured
- R Radiosonde balloon or radar
- U Height of cirriform ceiling layer unknown
- V Immediately following numerical value indicates a varying ceiling (also used with varying visibility)
- W Indefinite, sky obscured by surface base phenomenon, e.g. fog, blowing dust, snow

RELATIVE HUMIDITY (RH)

Reported in percent and computed from temperature and dewpoint

VISIBILITY (VV)

Reported in kilometers.

WEATHER AND OBSTRUCTION TO VISION SYMBOLS

A	Hail	IF	Ice fog
AP	Small hail	K	Smoke
BD	Blowing dust	L	Drizzle
BN	Blowing sand	R	Rain
BS	Blowing snow	RW	Rain showers
D	Dust	S	Snow
E	Sleet	SG	Snow grains
EW	Sleet showers	SP	Snow pellets
F	Fog	SW	Snow showers
GF	Ground fog	T	Thunderstorms
H	Haze	ZL	Freezing drizzle
IC	Ice crystals	ZR	Freezing rain

CLOUD ABBREVIATIONS

Ac	Altocumulus	Cs	Cirrostratus
As	Altostratus	Cu	Cumulus
Cb	Cumulonimbus	Ns	Nimbostratus
Cc	Cirrocumulus	Sc	Stratocumulus
Ci	Cirrus	St	Stratus

WIND

Direction in ten's of degrees from true north, speed in meters per second (mps). A "0000" indicates calm. A "G" indicates gusts; A "Q" indicates squall. Peak speed of gusts, when reported, follows G or Q. The contraction WSHFT in remarks followed by time group (GMT) indicates wind shift and its time of occurrence.

Examples: 0109 is 010 degrees, 9 mps.
3607G11 is 360 degrees, 7 mps, peak speed in gusts of 11 mps.

Table 6.3. Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-460								Field Site Trapani
Date 2 August 1978						Lat 37°33'N	Long 12°30'E	El Sea Level
TRAPANI (164290) 38°55'N 12°31'E Elev 7m 40.8 Km NE of Track Center								
1000	○	M		35.2	12.2	16	6.1	0/8
1100	○	M		36.2	13.2	15	5.1	0/8
1200	○	M		37.2	8.2	15	4.6	0/8
1400	○	M		32.2	20.2	36	5.1	0/8
1500	○	16.0		31.2	20.2	35	3.6	0/8
1500	○	M		33.2	21.2	35	3.0	0/8
PANTELLERIA (164700) 36°49'N 11°59'E Elev 187m 93.5 Km SW of Track Center								
0900	○	8.0	H	31.2	20.2	21	3.0	0/8
1300	○	8.0	H-	33.2	23.2	00	0.0	0/8
1400	○	8.0	H-	32.2	21.2	M	2.5	0/8
1500	○	8.0	H-	30.2	22.2	21	4.1	0/8
1600	○	8.0	H-	32.2	23.2	00	0.0	0/8
PALERMO/PUNTA RAISI (164050) 38°11'N 13°07'E Elev 21m 88.8 Km E of Track Center								
1020	○	M		28.2	15.2	07	5.6	0/8
1120	○	M		29.2	16.2	06	5.6	0/8
1200	○	14.0		29.2	13.2	06	6.2	0/8
1320	○	M		29.2	18.2	06	6.1	0/8
1350	○	M		29.2	17.2	06	6.1	0/8
1450	○	M		28.2	21.2	06	4.1	0/8
1500	○	11.0		28.2	21.2	06	4.1	0/8
1550	○	M		28.2	21.2	04	3.6	0/8

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-461								Field Site Trapani Track
Date 3 August 1978						Lat 37°33'N	Long 12°30'E	El Sea Level
TRAPANI (164290) 37°55'N 12°31'E Elev 7m 40.8 Km NE of Track Center								
0[illegible]	L90◎/◎	M		31.2	18.2	34	1.5	6/8 Ac 7/8 Ci
1000						32	4.1	
1200	100◎/◎	14.0		32.2	22.2	27	2.1	2/8 Ac 5/8 Ci
PANTELLERIA (164700) 36°49'N 11°59'E Elev 187m 93.5 Km SW of Track Center								
0900	/◎	M		35.2	11.2	20	6.1	2/8 Ci
1100				37.2	9.2	20	6.6	
1200	/◎	10.0		38.2	14.2	20	6.2	3/8 Ci
PALERMO/PUNTA RAISI (164050) 38°11'N 13°07'E Elev 21m 88.8 Km E of Track Center								
0900	/◎	8.0	H-	26.2	22.2	04	2.6	3/8 Ci
1020	/◎	7.0	H-	29.2	21.2	06	4.1	2/8 Ci
1100	/◎	8.0	H-	29.2	22.2	06	4.1	1/8 Ci
1200	25◎I80◎	8.0	H-	29.2	22.2	06	4.1	1/8 Cu 7/8 Ac
1250	25◎I80◎	9.0	H-	29.2	22.2	06	4.1	1/8 Cu 7/8 Ac

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-462								Field Site Trapani Track
Date 5 August 1978						Lat 37°33'N	Long 12°30'E	El Sea Level
TRAPANI (164290) 37°55'N 12°31'E Elev 7m 40.8 Km NE of Track Center								
0[illegible]0				29.2	21.2	35	2.6	0/8
0900				30.2	17.2	35	4.1	0/8
1000				32.2	14.2	35	4.1	0/8
1100				33.2	16.2	35	4.6	0/8
1200				33.2	15.2	35	5.1	0/8
1300				33.2	17.2	35	5.1	0/8
PANTELLERIA (164700) 36°49'N 11°59'E Elev 187m 93.5 Km SW of Track Center								
0820	100◎	8.0	H-	28.2	16.2	05	3.6	2/8 Ac
0900	100◎	8.0	H-	29.2	17.2	07	3.0	1/8 Ac
1000		9.0	H-	29.2	17.2	05	2.0	0/8
1100	◎	9.0	H-	30.2	14.2	05	2.0	0/8
1200	◎	9.0	H-	30.2	14.2	05	2.0	0/8
1300	◎			31.2	11.2	05	2.0	0/8

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-462 (Cont.)								Field Site: Trapani Track
Date: 5 August 1978								Lat 37°33'N Long 12°30'E El. Sea Level
PALERMO/PUNTA RAISI (164050) 38°11'N 13°07'E Elev 21m 88.8 Km E of Track Center								
0820	C	6.0	I-	26.2	23.2	04	1.5	0/8
0900	C	6.0	I-	26.2	23.2	04	1.0	0/8
1020	C	6.0	I-	26.2	23.2	00	0.0	0/8
1120	C	9.0	I-	27.2	22.2	04	3.0	0/8
1200	C	11.0		27.2	21.2	04	3.6	0/8
1250	C			27.2	21.2	04	5.6	0/8
1320	C			27.2	21.2	04	5.6	0/8
Flight No C-463								Field Site: Trapani Track
Date: 7 August 1978								Lat 37°33'N Long 12°30'E El Sea Level
TRAPANI (164290) 37°55'N 12°31'E Elev 7m 40.8 Km NE of Track Center								
0800	C			30.2	16.2	12	8.2	0/8
0900	C			32.2	11.2	14	9.2	0/8
1100	C					15	10.2	0/8
1200	100+C/C			34.2	7.2	15	10.2	5/8 Ac 7/8 Ci
1300	100+C/C					16	9.7	5/8 Ac 6/8 Ci
1400	/C					15	11.3	5/8 Ci
PANTELLERIA (164700) 36°49'N 11.59'E Elev 187m 93.5 Km SW of Track Center								
0800	C			30.2	11.2	18	9.7+	Gusts 14.9 0/8
0900	C			31.2	11.2	18	10.2+	Gusts 16.9 0/8
1100	C					18	16.4+	Gusts 22.6 0/8
1200	100+C			32.2	9.2	18	18.0+	Gusts 25.2 3/8 Ac
1300						18	18.0+	Gusts 24.7
PALERMO/PUNTA RAISI (164050) 38°11'N 13.07'E Elev 21m 88.8 Km E of Track Center								
0750	C			29.2	12.2	00	0.0	0/8
0900	C	15.0		31.2	11.2	21	5.7	0/8
0920	C	11.2		25.2	21.2	29	5.6	0/8
1020	C			30.2	12.2	03	4.1	0/8
1050	C			30.2	11.2	04	3.6	0/8
1200	100+C			30.2	20.2	06	3.6	4/8 Ac
1250	100+C			30.2	22.2	19	7.7	4/8 Ac
Flight No C-464								Field Site: Soesterberg
Date: 14 August 1978								Lat 51°56'N Long 5.35'E El 6m
DEBILT (062680) 52.6'N 5.12'E Elev 2m 32.1 Km NW of Track Center								
1100	15+C 120+C	7.0	H	18.2	14.2	22	5.7	4/8 Cu & Sc 7/8 Ac
1200	20+C 100+C	20.0		18.2	13.2	24	5.1	3/8 Cu & Sc 7/8 Ac
1400	20+C 100+C	20.0		20.2	11.2	23	5.1	2/8 Cu & Sc 6/8 Ac
1500	35+C 100+C/C	20.0		21.2	11.2	23	5.7	2/8 Sc 5/8 Ac 6/8 Ci
SOESTERBERG (062650) 52.8'N 5.17'E Elev 20m 30.2 Km NW of Track Center								
1100	150+C	6.0	H	17.2	12.2	23	5.1	7/8 Cu & Sc
1129	150+C 100+C	7.0	H	18.2	12.2	24	5.6	6/8 Cu & Sc 7/8 Ac
1200	150+C 100+C	15.0		18.2	11.2	25	6.7	6/8 Cu & Sc 7/8 Ac
1229	50+C 100+C	11.2		18.2	11.2	25	5.6	3/8 Cu & Sc 7/8 Ac
1310	150+C 100+C	11.2				23	6.6	5/8 Cu & Sc 7/8 Ac
1400	50+C 90+C/C	15.0		20.2	10.2	22	5.1	4/8 Cu & Sc 6/8 Ac 7/8 Ci
1429	50+C 90+C/C	11.2		21.2	10.2	23	6.6	4/8 Cu & Sc 6/8 Ac 7/8 Ci
1500	50+C 90+C/C	18.0		20.2	19.2	24	6.7	4/8 Cu & Sc 6/8 Ac 7/8 Ci
DE BILT (062750) 52.04'N 5.54'E Elev 48m 26.3 Km NE of Track Center								
1100	25+C 90+C	10.0		17.2	12.2	21	6.2	3/8 Cu & Sc 7/8 Ac
1129	25+C 90+C	9.0		18.2	12.2	22	6.6	2/8 Cu & Sc 7/8 Ac
1200	25+C 90+C	15.0		18.2	11.2	24	6.2	1/8 Cu 7/8 Ac
1229	25+C 90+C	11.2		18.2	11.2	21	6.1	1/8 Cu 7/8 Ac
1440	25+C 100+C	18.0		18.2	11.2	21	5.7	1/8 Cu 7/8 Ac
1429	25+C 90+C	11.2		19.2	12.2	20	5.1	1/8 Cu 7/8 Ac
1500	25+C 90+C/C	15.0		20.2	12.2	22	4.6	2/8 Cu 6/8 Ac 7/8 Ci

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-465								Field Site Meppen Track
Date 14 August 1978								Lat 53°00'N Long 7°37'E El 18m
BREMERHAVEN (101290) 53°31'N 8°36'E			Elev 7m 87.1 Km NE of Track Center					
1100	L10⊕	3.6	L-	16.2	14.2	20	4.1	8/8 Sc
1200	L10⊕	3.6	L-	16.2	14.2	20	4.6	8/8 Sc
1300	L10⊕	3.0	R-L-	15.2	14.2	23	[illegible]	8/8 Sc
1400	L20⊕	4.5	R-	16.2	14.2	21	5.6	8/8 Sc
1500	L20⊕	7.0	L-	16.2	14.2	21	6.2	8/8 Sc
EMDEN (102030) 53°20'N 7°13'E			Elev 6m 45.7 Km NW of Track Center					
1100	L5⊕	2.0	R-	15.2	14.2	23	6.6	8/8 Sc
1200	L10⊕	2.5	R-	15.2	14.2	22	[illegible]	8/8 Sc
1300	L15⊕	3.5	R-	16.2	14.2	21	5.6	8/8 Sc
1400	15⊙L100⊕	4.0	R-	17.2	14.2	22	8.2	4/8 Sc 8/8 As
1500	15⊙L100⊕	4.0	R-	18.2	14.2	22	6.7	4/8 Sc 8/8 As
BREMEN (102240) 53°3'N 8°48'E			Elev 3m 79.3 Km E of Track Center					
1120	25⊙L120⊙	7.0	R-	17.2	14.2	23	4.6	4/8 Cu & Sc 7/8 As
1200	L50⊙100⊕	7.0	R-	17.2	14.2	23	4.6	5/8 Cu & Sc 8/8 As
1250	L42⊙100⊕	8.0	R-	18.2	13.2	21	4.1	5/8 Sc 8/8 As
1320	L30⊙100⊕	11.2		18.2	13.2	23	5.1	5/8 Sc 8/8 As
1420	L42⊙100⊕	11.2		18.2	12.2	22	6.1	5/8 Sc 8/8 Ac
1500	42⊙L100⊙	18.0		18.2	12.2	22	4.1	2/8 Sc 7/8 Ac

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-466								Field Site Meppen Track
Date 15 August 1978								Lat 53°00'N Long 7°37'E El 18m
BREMERHAVEN (101290) 53°31'N 8°36'E			Elev 7m 87.1 Km NE of Track Center					
0800	150-⊙/-⊙	7.0	H	19.2	14.2	16	2.5	1/8 Ac 4/8 Ci
0900	150-⊙/-⊙	10.0		20.2	13.2	18	3.6	1/8 Ac 4/8 Ci
1000	150-⊙230-⊙	10.0		22.2	14.2	16	3.6	1/8 Ac 5/8 Ci
1100	150-⊙/-⊙	12.0		23.2	13.2	16	3.6	1/8 Ac 3/8 Ci
1200	/-⊙	15.0		25.2	11.2	16	4.1	3/8 Ci
1300	/-⊙	18.0		25.2	11.2	16	4.1	3/8 Ci
1400	/-⊙	18.0		26.2	11.2	17	4.6	1/8 Ci
EMDEN (102030) 53°20'N 7°13'E			Elev 6m 45.7 Km NW of Track Center					
0900	/-⊙	6.0	H	19.2	13.2	19	5.1	2/8 Ci
1000	/-⊙	8.0		20.2	12.2	18	5.6	2/8 Ci
1100	/-⊙	12.0		22.2	12.2	19	6.1	1/8 Ci
1200	/-⊙	13.0		24.2	12.2	19	6.2	1/8 Ci
1300	/-⊙	15.0		25.2	11.2	20	[illegible]	1/8 Ci
1400	35⊙/-⊕	12.0		25.2	12.2	21	[illegible]	3/8 Sc 8/8 Ci
BREMEN (102240) 53°3'N 8°48'E			Elev 3m 79.3 Km E of Track Center					
0900	150-⊙/-⊙	18.0		21.2	14.2	20	6.7	1/8 Ac 2/8 Ci
0950	150-⊙/-⊙			23.2	13.2	18	7.2	1/8 Ac 2/8 Ci
1050	/-⊙			24.2	13.2	17	6.1	2/8 Ci
1200	/-⊙	20.0		24.2	13.2	16	6.7	1/8 Ci
1320	/-⊙	11.2		26.2	13.2	17	8.2	1/8 Ci
1350	/-⊙			26.2	13.2	16	7.2	1/8 Ci

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-467								Field Site Soesterberg
Date 18 August 1978								Lat 51°56'N Long 5°35'E El 6m
DLBILT (062600) 52°6'N 5°12'E			Elev 2m 32.1 Km NW of Track Center					
1000	25⊙	20.0		17.2	10.2	28	5.1	3/8 Cu
1100	25⊙	25.0		18.2	9.2	29	5.7	4/8 Cu & Sc
1200	L30⊕	25.0		18.2	11.2	28	5.1	6/8 Cu & Sc
1300	L30⊙	25.0		18.2	10.2	31	4.6	5/8 Cu
1400	L25⊕	25.0		17.2	10.2	28	5.1	5/8 Cu
1500	L25⊕	20.0		17.2	9.2	29	5.7	5/8 Cu

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-467 (Cont.)								Field Site: Soesterberg
Date: 18 August 1978								Lat. 51°56'N Long. 5°35'E El 6m
SOESTERBERG (062650) 52°8'N 5°17'E Elev 20m 30.3 Km NW of Track Center								
1000	25⊕/-⊕	20.0		18.2	7.2	29	3.1	1/8 Cu 2/8 Ci
1100	25⊕/-⊕	25.0		19.2	6.2	30	4.1	1/8 Cu 2/8 Ci
1200	25⊕/-⊕	25.0		20.2	5.2	29	2.6	2/8 Cu 3/8 Ci
1300	35⊕	25.0		21.2	6.2	33	3.1	3/8 Cu
1400	35⊕	25.0		21.2	6.2	33	2.6	3/8 Cu
1500	35⊕	20.0		20.2	6.2		1.5	4/8 Cu
DELLEN (062750) 52°4'N 5°54'E Elev 48m 26.3 Km NE of Track Center								
1000	25⊕/⊕	25.0		17.2	8.2	31	2.6	2/8 Cu 3/8 Ci
1100	35⊕/-⊕	25.0		18.2	8.2	29	3.1	3/8 Cu 5/8 Ci
1200	35⊕/-⊕	25.0		19.2	7.2	26	2.6	2/8 Cu 3/8 Ci
1300	35⊕	25.0		20.2	7.2	28	4.1	2/8 Cu
1400	35⊕	25.0		20.2	5.2	31	4.1	2/8 Cu
1500	50⊕	25.0		21.2	6.2	29	1.5	2/8 Cu

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-468								Field Site Meppen Track
Date 21 August 1978								Lat 53°00'N Long 7°37'E El 18m
BREMERHAVEN (101290) 53°31'N 8°36'E Elev 7m 87.1 Km NE of Track Center								
0900	/-⊕	5.0	H	18.2	13.2	20	0.5	4/8 Ci
1000	/-⊕	6.0	H	20.2	15.2	22	0.5	1/8 Ci
1100	/-⊕	8.0		22.2	14.2	32	2.0	3/8 Ci
1200	/-⊕	8.0		22.2	15.2	32	4.1	2/8 Ci
1300	E230⊕	9.0		21.2	14.2	32	3.6	5/8 Ci
EMDEN (102030) 53°20'N 7°13'E Elev 6m 45.7 Km NW of Track Center								
0900	/-⊕	4.5	H	20.2	15.2	30	1.5	1/8 Ci
1000	⊂	9.0		22.2	14.2	30	1.5	0/8
1100	/-⊕	9.0		24.2	12.2	22	3.1	2/8 Ci
1200	E230⊕	8.0		25.2	12.2	30	1.5	5/8 Ci
1300	E230⊕	8.0		25.2	12.2	33	1.5	7/8 Ci
BREMEN (102240) 53°3'N 8°48'E Elev 3m 79.3 Km E of Track Center								
0900	/-⊕	8.0		21.2	13.2	30	2.6	3/8 Ci
1020	/-⊕			23.2	14.2	31	1.0	2/8 Ci
1120	/-⊕			24.2	14.2	32	3.0	1/8 Ci
1200	/-⊕	15.0		25.2	13.2	33	3.1	1/8 Ci
1320	/-⊕			25.2	13.2	32	2.0	1/8 Ci

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-469								Field Site Soesterberg Track
Date 22 August 1978								Lat 51°56'N Long 5°35'E El 6m
DEBILT (062690) 52°6'N 5°12'E Elev 2m 32.1 Km NW of Track Center								
1100	⊃	6.0	F-	24.2	15.2	23	3.1	0/8
1200	35⊕	6.0	F-	24.2	14.2	26	3.6	1/8 Cu
1300	E30⊕	6.0	F-	24.2	15.2	24	4.1	5/8 Sc
1400	30⊕	6.0	H	24.2	16.2	27	3.6	4/8 Cu & Sc
1500	30⊕	6.0	H	24.2	15.2	24	4.1	4/8 Cu
1600	30⊙	7.0	H	24.2	16.2	28	3.1	2/8 Cu
SOESTERBERG (062650) 52°8'N 5°17'E Elev 20m 30.3 Km NW of Track Center								
1029	⊃	6.0	H	23.2	13.2	23	4.6	0/8
1129	35⊕	7.0	H	24.2	13.2	25	5.1	3/8 Cu
1200	35⊕	7.0	H	24.2	13.2	26	5.7	3/8 Cu
1300	E38⊕	7.0	H	24.2	13.2	29	5.1	5/8 Cu
1400	E38⊕	7.0	H	24.2	13.2	29	6.2	7/8 Cu
1500	E38⊕	7.0	H	24.2	13.2	27	5.7	7/8 Cu
1600	38⊕	15.0		23.2	13.2	29	6.2	2/8 Cu

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks

Flight No. C-469 (Cont.) — Field Site: Soesterberg Track
Date 22 August 1978 — Lat. 51°56'N Long. 5°35'E El. 6m

DE LEEN (062750) 52°4'N 5°54'E Elev 48m 26.3 Km NE of Track Center

1100	35◯	4.8	H	23.2	14.2	23	6.2	1/8 Cu
1200	35◯	6.0	H	24.2	13.2	23	6.7	1/8 Cu
1300	35◯	7.6	H	24.2	13.2	23	5.7	1/8 Cu
1400	35◯	10.0		25.2	13.2	25	5.1	1/8 Cu
1500	35◯	10.0		25.2	13.2	27	4.6	2/8 Cu
1600	1.42◯	14.0		24.2	14.2	28	5.1	6/8 Cu

Flight No. C-470 (No flight data for this date) — Field Site Birkhot Track
Date 25 August 1978 — Lat 48°15'N Long 9°05'E El 762m

FREUDENSTADT (108150) 48°27'N 8°26'E Elev 797m 52.9 Km W of Track Center

0800	15◯230◯	20.0		16.2	11.2	02	1.0	1/8 Cu 4/8 Ci
0900	15◯L230◯	20.0		17.2	9.2	33	2.1	1/8 Cu 5/8 Ci
1000	15◯230◯	20.0		18.2	9.2	33	1.5	3/8 Cu 4/8 Ci

SPAICHINGEN (108180) 48°6'N 8°47'E Elev 973m 27.8 Km SW of Track Center

0800	230◯	7.0	F-	15.2	12.2	29	0.5	3/8 Ci
0900	15◯L230◯	9.0		16.2	10.2	26	1.0	1/8 Cu 5/8 Ci
1000	15◯L230◯	12.0		18.2	10.2	28	1.5	1/8 Cu 6/8 Ci

MEMMINGEN (109470) 47°59'N 10°15'E Elev 634m 91.5 Km SE of Track Center

0930	7◯	3.7	H			29	1.5	1/8 Ci
0952	7◯	8.0		18.2	10.2	29	2.0	2/8 Ci
1052	250◯	11.2		19.2	9.2	34	1.5	1/8 Ci

Flight No. C-471 — Field Site Birkhot Track
Date 11 September 1978 — Lat 48°15'N Long 9°05'E El 762m

FREUDENSTADT (108150) 48°27'N 8°26'E Elev 797m 52.9 Km W of Track Center

0600	1.30◯	25.0		14.2	11.2	23	2.1	5/8 Sc
0700	30◯	28.0		15.2	11.2	27	3.0	2/8 Sc
0800	30◯	25.0		16.2	11.2	27	4.1	3/8 Sc
0900	30◯100◯	25.0		16.2	12.2	27	5.7	2/8 Sc 3/8 Ac
1000	1.32◯	50.0		17.2	12.2	27	5.1	5/8 Sc 6/8 Ac

SPAICHINGEN (108180) 48°6'N 8°47'E Elev 973m 27.8 Km SW of Track Center

0600	30◯100◯	30.0		13.2	10.2	23	6.7	4/8 Sc 5/8 Ac
0700	1.35◯100◯	30.0		14.2	10.2	23	7.2	5/8 Sc 6/8 Ac
0900	1.30◯100◯	35.0		15.2	11.2	24	6.7	5/8 Sc 7/8 Ac
1200	1.30◯	60.0		18.2	12.2	26	5.7	7/8 Sc

ULM (108380) 48°23'N 9°59'E Elev 522m 68.2 Km ENE of Track Center

0700	1.43◯100◯	28.0		15.2	11.2	21	5.6	5/8 Sc 7/8 Ac
0800	1.43◯100◯	35.0		16.2	12.2	22	5.6	5/8 Sc 7/8 Ac
0900	34◯	40.0		18.2	13.2	22	4.6	3/8 Cu & Sc
1000	35◯50◯	40.0		21.2	13.2	22	5.6	2/8 Cu & Sc 5/8 Ac
1100	36◯1.46◯	45.0		21.2	12.2	24	5.1	1/8 Cu 7/8 Ac
1200	36◯45◯	50.0		22.2	13.2	22	5.1	2/8 Cu 5/8 Ac

Flight No. C-472 & C-473 — Field Site Birkhot Track
Date 11 September 1978 — Lat 48°15'N Long 9°05'E El 762m

FREUDENSTADT (108150) 48°27'N 8°26'E Elev 797m 52.9 Km W of Track Center

1300	1.30◯80◯	40.0		16.2	13.2	23	3.6	5/8 Sc 7/8 Ac
1400	1.27◯80◯	40.0	R-	16.2	13.2	24	3.6	5/8 Sc 8/8 Ac
1500	1.26◯80◯	40.0	R-	17.2	13.2	25	4.1	5/8 Sc 8/8 Ac
1600	1.26◯80◯	40.0		17.2	13.2	23	4.1	5/8 Sc 7/8 Ac
1700	1.23◯80◯	55.0		17.2	13.2	24	4.1	5/8 Sc 7/8 Ac

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks

Flight No C-472 & C-473 (Cont.) — Field Site. Birkhof Track
Date: 11 September 1978 — Lat 48°15'N Long 9°05'E El 762m

SPAICHINGER (108180) 48 6'N 8°47'E Elev 973m 27.8 Km SW of Track Center								
1200	L30⊕	60.0		18.2	12.2	26	5.7	7/8 Sc
1300	L26⊕	60.0		18.2	12.2	26	7.7	5/8 Sc
1400	L26⊕	60.0		18.2	12.2	26	7.2	6/8 Sc
1500	L26⊕	50.0		18.2	12.2	26	9.3	6/8 Sc
1600	L26⊕	50.0		18.2	12.2	26	9.2	5/8 Sc
1700	L26⊕	40.0		17.2	12.2	25	9.2	6/8 Sc
ULM (108380) 48°23'N 9°59'E Elev 522m 68.2 Km ENE of Track Center								
1200	36⊕45-⊕	50.0		22.2	13.2	22	5.1	2/8 Cu 5/8 Ac
1300	L36⊕45⊕	50.0		22.2	14.2	23	5.1	5/8 Cu 6/8 Ac
1400	36⊕L46⊕	45.0		22.2	14.2	24	4.6	4/8 Cu 7/8 Ac
1500	36⊕46⊕/-⊕	55.0		23.2	13.2	27	5.7	3/8 Cu & Sc 4/8 Ac 5/8 Ci
1600	36⊕45⊕/⊕	55.0		21.2	13.2	24	4.6	3/8 Cu & Sc 4/8 Ac 5/8 Ci
1700	35⊕45⊕/⊕	50.0		21.2	13.2	24	4.1	2/8 Cu 3/8 Ac 4/8 Ci

Flight No C-474 — Field Site Birkhof Track
Date 13 September 1978 — Lat 48°15'N Long 9°05'E El 762m

FRIEDENSTAD (108150) 48°27'N 8°26'E Elev 797m 52.9 Km W of Track Center								
0800	25⊕100⊕	20.0		9.2	7.2	25	1.0	1/8 Cu 4/8 Ac
0900	25⊕L100⊕	22.0		11.2	5.2	23	1.5	1/8 Cu 5/8 Ac
1000	100⊕	25.0		12.2	4.2	27	2.5	3/8 Ac
1100	100⊕	28.0		13.2	4.2	26	2.5	3/8 Ac
1200	100⊕/⊕	30.0		14.2	3.2	23	2.1	3/8 Ac 5/8 Ci
1300	100⊕/⊕	45.0		15.2	3.2	29	1.5	1/8 Ac 1/8 Ci
SPAICHINGER (108180) 48 6'N 8°47'E Elev 973m 27.8 Km SW of Track Center								
0800	10⊕100⊕/⊕	25.0		8.2	5.2	21	1.5	1/8 Cu 3/8 Ac 5/8 Ci
0900	10⊕160⊕/⊕	25.0		10.2	5.2	26	1.5	1/8 Cu 2/8 Ac 2/8 Ci
1000	15⊕100-⊕	30.0		12.2	4.2	26	1.5	1/8 Cu 1/8 Ac
1100	15⊕100-⊕	40.0		13.2	2.2	25	1.5	1/8 Cu 1/8 Ac
1200	25⊕100-⊕	40.0		14.2	3.2	22	2.1	1/8 Cu 1/8 Ac
1300	25⊕100-⊕	45.0		15.2	4.2	20	2.0	1/8 Cu 2/8 Ac
ULM (108380) 48 23'N 9°59'E Elev 522m 68.2 Km ENE of Track Center								
0800	25⊕L230⊕	10.0		10.2	8.2	23	3.0	1/8 Cu 5/8 Cc
0900	25⊕L230⊕	20.0		13.2	9.2	21	2.6	1/8 Cu 5/8 Cc
1000	25⊕L100⊕200⊕	20.0		13.2	8.2	21	2.5	1/8 Cu 5/8 Ac 7/8 Ci
1100	25⊕L100⊕200⊕	30.0		14.2	7.2	21	3.0	1/8 Cu 5/8 Ac 7/8 Ci
1200	25⊕100⊕200-⊕	30.0		16.2	8.2	21	2.6	1/8 Cu 4/8 Ac 7/8 Ci
1300	25⊕L100⊕200⊕	25.0		16.2	7.2	18	2.5	1/8 Cu 5/8 Ac 7/8 Ci

Flight No C-475 — Field Site Yeovilton Track
Date 15 September 1978 — Lat 50°56'N Long 2°27'E El 60m

YEOVILTON (038530) 51 0'N 2 38'W Elev 23m 14.8 Km NW of Track Center								
1200	20⊕/-⊕	25.0		19.2	11.2	30	9.3	4/8 Cu 6/8 Ci
1300	18⊕/-⊕	25.0		20.2	11.2	29	10.3	3/8 Cu 5/8 Ci
1400	20⊕/⊕	30.0		20.2	11.2	33	7.7	3/8 Cu & Sc 5/8 Ci
1500	20⊕/⊕	30.0		19.2	11.2	33	8.2	3/8 Sc 6/8 Ci
1600	20⊕/⊕	30.0		18.2	11.2	33	8.2	4/8 Sc 6/8 Ci
1700	L20⊕/⊕	25.0		18.2	11.2	33	7.7	5/8 Sc 6/8 Ci
PORTLAND (038550) 50 31'N 2 27'W Elev 53m 46.3 Km S of Track Center								
1200	15⊕/⊕	16.0		17.2	15.2	27	6.2	2/8 Cu & Sc 4/8 Cs
1300	15⊕/⊕	16.0		17.2	16.2	27	6.2	2/8 Cu & Sc 4/8 Cs
1400	15⊕/⊕	16.0		18.2	15.2	27	5.1	1/8 Cu & Sc 4/8 Cs
1500	15⊕	10.0		18.2	16.2	27	5.1	4/8 Cu & Sc
1600	15⊕	10.0		18.2	15.2	27	8.2	4/8 Sc
1700	L20⊕	10.0		18.2	15.2	27	6.2	6/8 Sc

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-475 (Cont.)								Field Site Yeovilton Track
Date. 15 September 1978								Lat. 50°56'N Long 2°27'E El 60m
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev 11m 46.4 Km ESE of Track Center								
1200	20⊙/③	30.0		19.2	13.2	30	8.2	3/8 Cu 5/8 Ci
1400	35⊙E 250④	30.0		21.2	11.2	28	7.2	1/8 Cu 7/8 Ci
1500	35⊙E 250④	30.0		21.2	11.2	28	7.2	1/8 Cu 7/8 Ci
1600	35⊙E 250④	30.0		20.2	12.2	29	4.6	1/8 Cu & Sc 6/8 Ci
1700	35⊙E 250④	30.0		19.2	12.2	31	5.1	1/8 Cu & Sc 6/8 Ci
Flight No C-476								Field Site Yeovilton Track
Date 16 September 1978								Lat 50°56'N Long 2°27'E El 60m
YEOVILTON (038530) 51°0'N 2°38'W Elev 23m 14.8 Km NW of Track Center								
0900	15⊙/①	12.0		15.2	13.2	21	3.1	3/8 Cu & Sc 4/8 Ci
1000	L20④	14.0		16.2	13.2	25	6.2	5/8 Cu
1100	20①	15.0		18.2	14.2	24	6.7	4/8 Cu & Sc
1200	15⊙/①	15.0		19.2	14.2	24	8.8	3/8 Cu & Sc 3/8 Ci
1300	20⊙/①	15.0		19.2	14.2	24	8.2	3/8 Cu & Sc 3/8 Ci
1400	20⊙100⊙/①	15.0		17.2	14.2	23	9.3	3/8 Cu & Sc 4/8 Ac 4/8 Ci
1500	20⊙/①	15.0		18.2	14.2	24	10.3	2/8 Cu & Sc 2/8 Ci
1600	18⊙/①	15.0		17.2	14.2	23	10.3	1/8 Sc 1/8 Ci
PORTLAND (038550) 50°31'N 2°27'W Elev 53m 46.3 Km S of Track Center								
0900	20①	25.0		15.2	15.2	24	4.6	4/8 Sc
1000	20①	25.0		17.2	15.2	22	3.6	4/8 Sc
1100	F25⑦	25.0		17.2	15.2	21	5.1	7/8 Sc
1200	E25⊕	16.0		16.2	15.2	20	5.1	8/8 Sc
1300	E25⊕	16.0		16.2	15.2	21	5.1	8/8 Sc
1400	L25⊕	16.0		16.2	15.2	22	5.1	8/8 Sc
1500	E25⊕	16.0		16.2	15.2	22	5.1	8/8 Sc
1600	E15⑩	5.0	F-	16.2	15.2	23	6.2	7/8 Sc
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev 11m 46.4 Km ESE of Track Center								
0900	E18⊕	20.0		15.2	13.2	25	2.6	8/8 Sc
1000	E20⑩	20.0		17.2	13.2	21	4.6	5/8 Sc
1100	E20⑩	20.0		18.2	15.2	20	6.2	5/8 Cu
1200	20⊙100-①	25.0		19.2	13.2	21	6.2	3/8 Cu 3/8 Ac
1300	L22⑩/①	25.0		18.2	14.2	21	7.2	5/8 Cu 5/8 Ci
1400	E11⑩/①	18.0		17.2	13.2	21	6.7	6/8 Cu 6/8 Ci
1500	E13⑩/①	15.0		17.2	14.2	22	6.2	6/8 Sc 6/8 Ci
1600	E13⑩	10.0		17.2	14.2	23	6.2	7/8 Sc
Flight No C-477								Field Site Yeovilton Track
Date 18 September 1978								Lat 50°56'N Long 2°27'E El 60m
YEOVILTON (038530) 51°0'N 2°38'W Elev 23m 14.8 Km NW of Track Center								
0900	120①	15.0	H	10.2	8.2	00	0.0	3/8 Ac
1000	25⊙140①	15.0	H	14.2	9.2	00	0.0	1/8 Cu 3/8 Ac
1100	25⊙140-①	18.0		16.2	9.2	25	1.0	1/8 Cu 4/8 Ac
1200	25⊙140-①	20.0		17.2	7.2	32	2.6	1/8 Cu 3/8 Ac
1300	25⊙140-⊙/-①	25.0		17.2	7.2	29	3.6	1/8 Cu 1/8 Ac 2/8 Ci
1400	25⊙/-⊙	30.0		17.2	7.2	35	3.6	1/8 Cu 2/8 Ci
PORTLAND (038550) 50°31'N 2°27'W Elev 53m 46.3 Km S of Track Center								
0900	140⊙/-①	29.0		14.2	8.2	07	3.1	1/8 Ac 2/8 Ci
1000	25⊙140-①	30.0		15.2	9.2	09	2.6	1/8 Sc 2/8 Ac
1100	25⊙140-①	30.0		16.2	10.2	13	2.1	1/8 Cu 3/8 Ac
1200	15⊙140-⊙	20.0		16.2	9.2	23	1.0	1/8 Cu & Sc 1/8 Ac
1300	25⊙/-①	20.0		17.2	10.2	25	2.1	1/8 Cu 1/8 Ci
1400	25⊙/①	20.0		17.2	11.2	23	3.1	1/8 Sc 3/8 Ci
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev 11m 46.4 Km ESE of Track Center								
0900	130⊙/⑩	30.0		11.2	7.2	34	1.0	4/8 Ac 5/8 Ci
1000	25⊙130⊙	40.0		14.2	9.2	35	1.5	1/8 Cu 3/8 Ac
1100	25⊙130-①	40.0		15.2	7.2	33	2.1	1/8 Cu 3/8 Ac
1200	35⊙130-①	40.0		17.2	7.2	29	1.5	2/8 Sc 3/8 Ac
1300	35⊙/-①	40.0		17.2	6.2	30	4.1	1/8 Sc 1/8 Ci
1400	35⊙/-①	40.0		18.2	5.2	26	4.1	1/8 Sc 3/8 Ci

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No C-478								Field Site Rodby Track
Date 25 September 1978								Lat 54°41'N Long 11°08'E El Sea Level
KLGNAFS (061190) 54°51'N 10°0'E Elev 23m 75.0 Km WNW of Track Center								
1200	25⊙150-⊕	18.0		14.2	11.2	27	8.2	4/8 Cb 6/8 Ac
1500	E24⊕	20.0		14.2	10.2	29	8.2	6/8 Cb
1800	25⊙150⊙	25.0		12.2	9.2	28	6.2	2/8 Cu 3/8 Ac
GLDSLR RFV (061470) 54°25'N 12°11'E Elev 1m 73.9 Km E of Track Center								
1200	35⊙L150⊙	22.0		12.2	12.2	25	6.2	3/8 Sc 8/8 Ac
1500	25⊙150-⊕/⊕	22.0		13.2	11.2	23	5.1	2/8 Sc 6/8 Ac 7/8 Cs
1800	35⊙L150⊙	20.0	H	13.2	10.2	23	7.2	3/8 Cu & Sc 7/8 Ac
OMO (061510) 55°10'N 11°9'E Elev 2m 53.7 Km NNW of Track Center								
1200	25⊙150-⊕	20.0		14.2	13.2	27	6.2	2/8 Cb 5/8 Ac
1500	E25⊙	20.0		14.2	14.2	27	9.3	6/8 Cb
Flight No C-479								Field Site Rodby Track
Date 26 September 1978								Lat 54°41'N Long 11°08'E El Sea Level
KLGNAFS (061190) 54°51'N 10°0'E Elev 23m 75.0 Km WNW of Track Center								
0900	25⊙/⊙	20.0		13.2	10.2	25	8.2	2/8 Cb 4/8 Ac
1200	25⊙150-⊙/⊙	20.0		15.2	9.2	25	7.2	2/8 Cb 3/8 Ac 6/8 Ci
GEDSER RFV (061470) 54°25'N 12°11'E Elev 1m 73.9 Km E of Track Center								
0900	35⊙	22.0		12.2	10.2	23	9.3	1/8 Cu
1200	35⊙150-⊙/⊙	20.0		12.2	9.2	23	8.2	1/8 Cu 4/8 Ac 6/8 Ci
OMO (061510) 55°10'N 11°9'E Elev 2m 53.7 Km NNW of Track Center								
0900	150-⊙	25.0		13.2	13.2	23	8.2	4/8 Ac
1500	E30⊙			13.2	13.2	23	9.3	5/8 Sc

Also included in this section are portions of several satellite photographs, typical of those received from ETAC, which illustrate cloud conditions encountered during the OPAQUE V deployment. Even though photographs for each flight interval have been evaluated as illustrated in Table 6.4, only four samples have been reproduced for inclusion in this report. In order to identify the entire flight interval to be associated with each satellite photograph, the flight times listed in Table 6.4 have been expanded to reflect take-off to landing times as extracted from the original flight logs. These times are therefore slightly longer than the data intervals identified in Section 7. The four photographs selected for inclusion are shown as Fig. 6-4 and represent the cloud conditions encountered during flights C-460, C-466, C-471, C-472, C-473, and C-475.

Table 6.4. Satellite Cloud Cover Comparisons

Flight	1978 Date	Flight Times GMT	Map Time GMT	Track Flown	OPAQUE V Flight Track Conditions					
					Trapani	Soesterberg	Meppen	Birkhof	Yeovilton	Rodby
C-460	2 Aug	1035-1550	1309	Trapani	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-461	3 Aug	0756-1247	1310	Trapani	Thin Clouds	Thin Clouds	Thin Clouds	Thin Clouds	Cloudy	Cloudy
C-462	5 Aug	0750-1326	1309	Trapani	Clear	Cloudy	Cloudy	Thin Clouds	Cloudy	Cloudy
C-463	7 Aug	0834-1341	1300	Trapani	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-464	14 Aug	1101-1538	1300	Soesterberg	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-465	14 Aug	1101-1536	1300	Meppen	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-466	15 Aug	0933-1342	1310	Meppen	Thin Clouds	Thin Clouds	Thin Clouds	Thin Clouds	Cloudy	Cloudy
C-467	18 Aug	0827-1523	1309	Soesterberg	Clear	Thin Clouds	Thin Clouds	Thin Clouds	Clear	Cloudy
C-468	21 Aug	0847-1320	1309	Meppen	Clear	Thin Clouds	Thin Clouds	Thin Clouds	Clear	Thin Clouds
C-469	22 Aug	1102-1615	1309	Soesterberg	Thin Clouds	Thin Clouds	Thin Clouds	Thin Clouds	Cloudy	Thin Clouds
C-470	25 Aug	0852-0956	1529	Birkhof	Clear	Thin Clouds	Thin Clouds	Thin Clouds	Cloudy	Cloudy
C-471	11 Sep	0706-0935	1310	Birkhof	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-472	11 Sep	1151-1641	1310	Birkhof	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-473	11 Sep	1500-1641	1310	Birkhof	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-474	13 Sep	0850-1335	1309	Birkhof	Clear	Cloudy	Cloudy	Thin Clouds	Cloudy	Cloudy
C-475	15 Sep	1155-1748	1310	Yeovilton	Clear	Cloudy	Cloudy	Thin Clouds	Cloudy	Cloudy
C-476	16 Sep	0944-1544		Yeovilton	No Maps	This Date				
C-477	18 Sep	1006-1400	1309	Yeovilton	Clear	Cloudy	Cloudy	Thin Clouds	Thin Clouds	Cloudy
C-478	25 Sep	1304-1655	1310	Rodby	Clear	Clear	Clear	Clear	Thin Clouds	Thin Clouds
C-479	26 Sep	0853-1300		Rodby	No Maps	This Date				

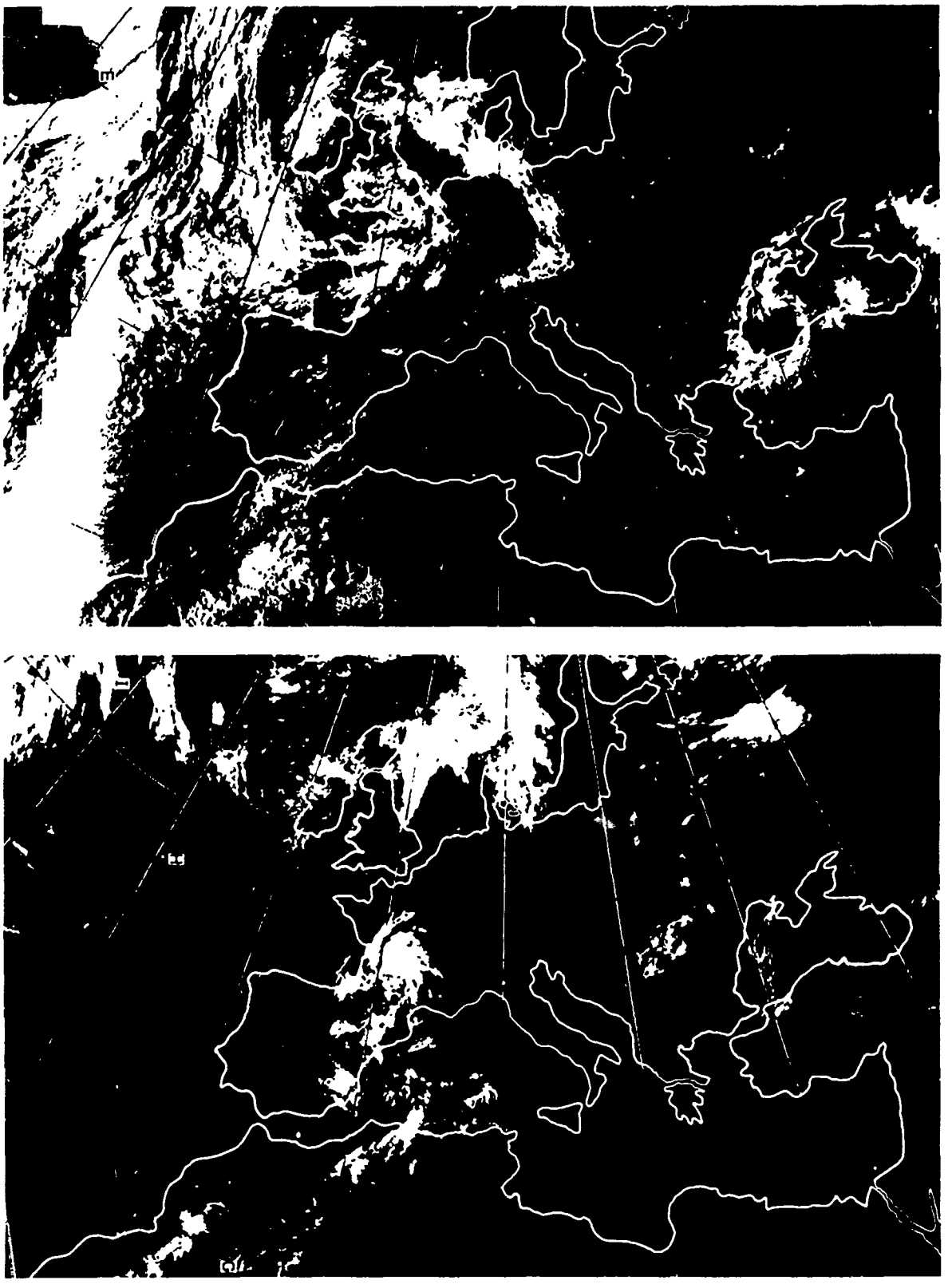


Fig. 6-4a Meteosat Photographs for 2 August 1978 1309 GMT Reference FR C 460 (Upper) and for 18 August 1978 1310 GMT Reference FR C 466 (Lower)

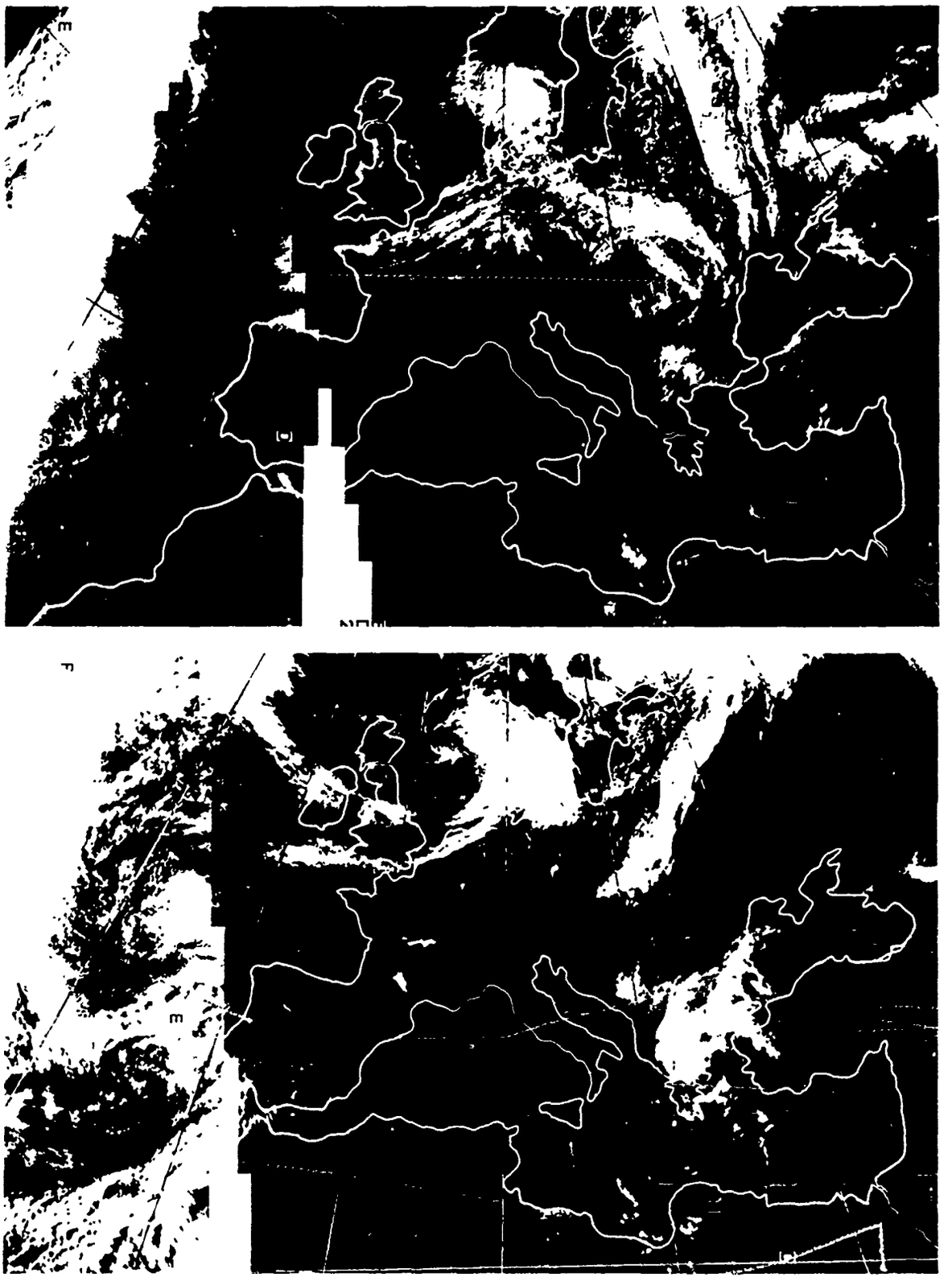


Fig 6-4b Satellite Photographs for 11 September 1978, 1310 GMT Reference Fig C-47.1 (Upper) and for 19 September 1978 1310 GMT, Reference Fig C-47.2 (Lower)

7. DATA PRESENTATION

7.1. AIRBORNE DATA AND FLIGHT SUMMARY

Between 2 August and 26 September 1978, twenty flights were made in northern Europe. Nineteen of these flights contain useable data profiles. Selected data for these flights are reported herein.

The 19 flights were conducted in northern Europe on six flight tracks in Sicily, Germany, the Netherlands, England and Denmark (see Fig. 1-1). The latitude, longitude, and altitude of each flight track are given in Table 7.1. The terrain beneath three of the flight tracks, those in northern Germany, the Netherlands and England, was low lying and flat, mostly cultivated farmland. The southern Germany track was over a high cultivated plateau, while the flight tracks in Sicily, Denmark were mostly over water.

The ground station operated from 2 August to 16 September 1978 near the flight tracks in Sicily, Germany and England, but was not used during the flights in Denmark and the Netherlands. Its location and dates of operation are also noted in Table 7.1.

PHOTOGRAPHIC DOCUMENTATION

Sky and terrain conditions encountered during the data flights were documented photographically during each straight and level flight sequence, at each of several designated altitudes, in conjunction with the radiometric measurements made in each spectral filter. On sunlit days the documentary photographs were taken simultaneously with the measurements made by the upper hemisphere scanner

Table 7.1. Location and Ground Elevation of Flight Tracks and Ground Sites

Field Site	Latitude	Longitude	Approximate Ground Elevation (meters)	Dates of Operation (1978)	Flight No
FLIGHT TRACK					
Trapani, Sicily	37°33'N	12°30'E	Sea Level	Aug 2,3,5,7	460,461,462,463
Soesterberg, Netherlands	52°56'N	05°35'E	6	Aug 14,18,22	464,467,469
Meppen, Germany	53°00'N	07°37'E	18	Aug 17,35,21	465,466,468
Birkhof, Germany	48°15'N	09°05'E	762	Sep 11,13	471,472,473,474
Yeovilton, England	50°56'N	02°27'W	60	Sep 15,16,18	475,476,477
Rodby, Denmark	54°51'N	11°08'E	Sea Level	Sep 25,26	478,479
GROUND STATION					
Trapani, Sicily	37°55'N	12°29'E		Aug 2,3,5,7	
Meppen, Germany	52°52'N	07°23'E		Aug 10,14,15,18,21	
Birkhof, Germany	48°13'N	09°11'E		Aug 24,25,28	
				Sep 11,13	
Yeovilton England	51°01'N	02°37'W		Sep 15,16	

in the sun mode. On overcast days the photographs were taken simultaneously with the measurements of sky and terrain radiance. One should be aware that while the photographs are instantaneous, the data measurements require a four-minute interval for completion. In four minutes the aircraft travels approximately ten miles.

The photographs illustrating upper and lower hemisphere conditions during each of the 19 flights have been examined and classified with respect to discernible cloud conditions. A summary of these general cloud and terrain descriptions, augmented by the descriptions given by the on-board meteorologist, is presented in Table 7.2.

Table 7.2. Summary of Hemispherical Pictures and In-Flight Meteorologists Descriptions

UPPER HEMISPHERE

Clear ☼ Scattered ☁ Broken ✙ Overcast ~ Thin V Varying

Flight No	Track	Satellite Picture	Filter No	300m (60-330m)	1,500m (540-1830m)	3000m (2130-4020m)	5700m (4050-6240m)
C-460	Trapani	Clear	2,3 4,5			☼	
C-461	Trapani	Thin Clouds	2,3 4,5	☁ ☼	☁ ~	☁ ☼V☁	☁ ☼V☁
C-462	Trapani	Clear	2,3 4,5	☼	☼	☼	
C-463	Trapani	Clear	2,3 4,5	☼	☼V☁	V☼	
C-464	Soesterberg	Clouds	2,3 4,5	✙ ✙	✙ ✙		
C-465	Meppen	Clouds	2,3 4,5	✙ ✙	✙ ✙		
C-466	Meppen	Thin Clouds	2,3 4,5	☼ ☼V☼	V☼ V☼	V☼ V☼	V☼ V☼
C-467	Soesterberg	Thin Clouds	2,3 4,5	☼ ☼	☼ ☼	V☼	
C-468	Meppen	Thin Clouds	2,3 4,5	☼ ☼	☼ ☼	V☼ V☼	V☼ V☼
C-469	Soesterberg	Thin Clouds	2,3 4,5	☼ V☼	☼ V☼		
C-471	Birkhof	Clouds	2,3 4,5	✙ ✙	✙ ✙		
C-472	Birkhof	Clouds	2,3 4,5	☼V☁ ☼V✙	☼ ☼	V☼	
C-473	Birkhof	Clouds	2,3 4,5	☼V✙ ☼V✙	☼V☼V✙ ☼V✙		
C-474	Birkhof	Thin Clouds	2,3 4,5	V☼V☁ V☼	V☼ V☼	V☼	
C-475	Yeovilton	Clouds	2,3 4,5	☼V☁ ☼V☼V✙	☼V☁ ✙	✙ ✙	✙ ✙
C-476	Yeovilton	Missing	2,3 4,5	☼ ☼V☁	V☼ ☼	V☼ ☼	V☼
C-477	Yeovilton	Thin Clouds	2,3 4,5	☼ V☼	☼V☁ V☼	V☼	
C-478	Rodby	Thin Clouds	2,3 4,5	☼V☁ ✙	☼V✙ ☼V✙	☼V✙ ☼V✙	✙ ☼V☁
C-479	Rodby	Missing	2,3 4,5	☼ ☼V☁	☼ ☼V☁	☼V☁ ☼V✙	☼V☁ ✙

Table 7.2 (cont.).

LOWER HEMISPHERE

Flight No and Track	Filter No	300m (60-330m)		1500m (540-1830m)		3000m (2130-4020m)		5700m (4080-6240m)	
		Clouds	Haze	Clouds	Haze	Clouds	Haze	Clouds	Haze
C-460 shallow water coast nearby	2,3 4,5	- -	light light	- -	* moderate	- -	* heavy	- -	Heavy heavy
C-461 shallow water coast nearby	2,3 4,5	- -	light light	- -	moderate -	- -	heavy heavy	- -	heavy very heavy
C-462 shallow water coast nearby	2,3 4,5	- -	light light	- -	moderate moderate	- -	heavy moderate	- -	very heavy heavy
C-463 shallow water coast nearby	2,3 4,5	- -	light light	- -	moderate moderate	- -	heavy heavy	- -	heavy very heavy
C-464 green/brown fields	2,3 4,5	- -	light light	- 2V2	light moderate	- -	- -	- -	- -
C-465 green/brown fields	2,3 4,5	- -	light light	- -	light light	- -	- -	- -	- -
C-466 green/brown fields	2,3 4,5	- -	light light	- -	moderate moderate	V2 V2	heavy very heavy	V2 V2	very heavy very heavy
C-467 green/brown fields	2,3 4,5	- -	light light	- -	light moderate	2 2	very heavy very heavy	2 2	very heavy very heavy
C-468 green/brown fields	2,3 4,5	- -	moderate light	- -	moderate heavy	2 2	very heavy very heavy	2 2	very heavy very heavy
C-469 green/brown fields	2,3 4,5	- -	moderate light	- -	heavy moderate	2 2	very heavy very heavy	2 2	very heavy very heavy
C-471 forest/green fields	2,3 4,5	- -	light light	- -	light light	- -	- -	- -	- -
C-472 forest/green fields	2,3 4,5	- -	light light	2 -	light -	2V2 2V2	moderate moderate	2V2 -	very heavy very heavy
C-473 forest/green fields	2,3 4,5	- -	light light	- -	light light	- -	- -	- -	- -
C-474 forest/green fields	2,3 4,5	- -	light light	- -	light light	V2 V2	moderate moderate	V2 2V2	heavy heavy
C-475 green/brown fields	2,3 4,5	- -	light light	- -	light light	2V2 2V2	heavy heavy	2V2 2V2	very heavy very heavy
C-476 green/brown fields	2,3 4,5	- -	light light	- 2V2	moderate moderate	2 2	heavy heavy	2 2	heavy very heavy
C-477 green/brown fields	2,3 4,5	- -	light light	- -	light moderate	2 V2	heavy heavy	- -	- -
C-478 shallow water coast nearby	2,3 4,5	- -	light light	V2 V2	moderate moderate	V2 2	moderate moderate	2 2V2	moderate moderate
C-479 shallow water coast nearby	2,3 4,5	- -	light light	- V2	moderate moderate	V2 2	moderate moderate	V2 2	moderate moderate

*no photograph

The examination of the lower hemisphere photographs in the assessment of underlying haze, as indicated in Table 7.2, used the following general criteria

Haze Condition	Observed Characteristics
Light	nadir scene clear and sharp, thin ring of horizon haze.
Moderate	nadir scene thinly obscured, broad ring of horizon haze.
Heavy	nadir features difficult to identify, full frame obscured by haze
Very Heavy	nadir features fully obscured, full frame totally obscured by haze

The upper hemisphere cloud conditions for each flight appear to fall into five very general categories: (1) clear, *i.e.* cloud free, (2) mostly clear to scattered clouds; (3) mostly scattered to broken clouds; (4) mostly broken clouds to overcast; (5) mostly overcast.

Photographs illustrating typical sky and terrain conditions during four of the flights reported herein are shown in Figs. 7-1 and 7-2. In each instance, the picture on the left represents the sky (upper hemisphere) as seen through a 180-degree lens, and the picture on the right represents the terrain (lower hemisphere). The photographs were selected to represent the conditions encountered at both the highest and lowest flight altitudes during each of the four flights.

The pictures representing flight C-462 (Fig. 7-1) illustrate the mostly clear case, the conditions of category one, and the Trapani flight track. The track was over the ocean near the west coast of Sicily.

The pictures representing flight C-476 (Fig. 7-2) illustrate the cloud conditions of category two. Flight C-476 was over the Yeovilton track. Typical terrain features were rolling green and brown fields interspersed with occasional small towns.

The pictures representing flight C-473, (Fig. 7-1) illustrate category four. Flight C-473 was over the Birkhof track in southern Germany. The underlying terrain was mostly cultivated farmlands interspersed with woods and valleys.

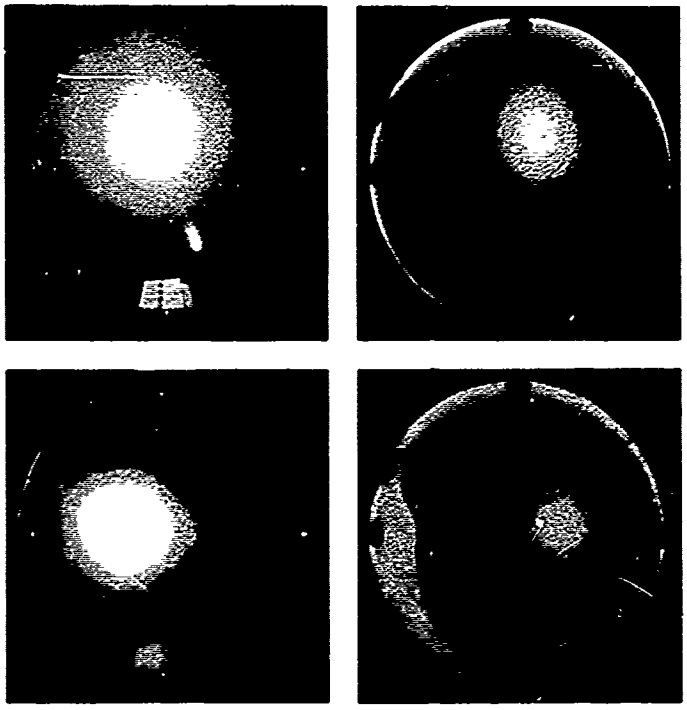
The pictures representing flight C-465 (Fig. 7-2) illustrate the mostly overcast conditions of category five. Flight C-465 was over the Jeppen track in northern Germany. Typical terrain features were heavily cultivated, low lying, flat farmlands interspersed with occasional dark woods and small towns.

RADIOMETRIC DOCUMENTATION

Table 7.3 contains a summary of pertinent descriptive information on the 19 flights for which radiometric data are reported herein. The flight numbers are sequential. The times under the total time of data-taking column are Greenwich Mean Time (GMT) and Local Civil Time (LCT). The LCT is equal to GMT+1 except during the flights in England, where the two are equivalent. The sun zenith angles are tabulated for the time when data-taking began, at the time of sun transit (minimum sun zenith angle), and at the conclusion of the last data-taking. The maximum and minimum flight altitudes are noted in columns 12 and 13.

Table 7.3. Flight Data Summary, Including ST&LV and V-PRO Flight Elements, OPAQUE IV

Flight No	Date (1978)	Total Time of Data Taking				Filter	Sun Zenith Angle (degrees)			Flight Altitude meters (AGL)	
		Start		End			Start	Transit	End	Min	Max
		GMT	LCT	GMT	LCT						
C-460	2 Aug	1142	1342	1346	1546	2.3	20.6	-	38.5	120	6210
		1350	1550	1501	1701	4.5	39.1	-	52.9	150	6090
C-461	3 Aug	0858	1058	1037	1237	2.3	36.3	-	21.8	90	4680
		1043	1243	1206	1406	4.5	21.3	20.0	22.8	120	4320
C-462	5 Aug	0851	1051	1043	1243	2.3	37.8	-	21.6	90	6120
		1049	1249	1240	1440	4.5	21.4	20.6	27.8	90	6120
C-463	7 Aug	0928	1128	1110	1310	2.3	31.7	-	21.1	90	6090
		1118	1318	1256	1456	4.5	21.1	-	30.7	120	6090
C-464	14 Aug	1159	1259	1238	1338	2.3	37.7	-	39.2	90	2130
		1243	1343	[illegible]	1422	4.5	39.5	-	42.6	90	1500
C-465	14 Aug	1358	1458	1434	1534	2.3	48.0	-	52.5	90	1500
		1440	1540	1510	1610	4.5	53.1	-	57.4	90	1290
C-466	15 Aug	0919	1019	1056	1156	2.3	47.1	-	39.6	90	6000
		1104	1204	1303	1403	4.5	39.4	38.9	42.8	90	5910
C-467	18 Aug	1116	1216	1257	1357	2.3	39.1	38.8	41.8	120	4710
		1302	1402	1435	1535	4.5	42.1	-	52.2	90	4710
C-468	21 Aug	0920	1020	1058	1158	2.3	48.6	-	43.4	120	5820
		1102	1202	1244	1344	4.5	41.3	40.9	43.3	120	6210
C-469	22 Aug	1158	1258	1337	1437	2.3	40.3	-	46.7	90	5820
		1342	1442	1527	1627	4.5	47.0	-	60.5	90	5880
C-471	11 Sep	0739	0839	0812	0912	2.3	64.6	-	59.0	0	540
		0818	0918	0850	0949	4.5	58.4	-	54.6	0	540
C-472	11 Sep	1235	1335	1342	1442	2.3	46.6	-	53.3	0	5280
		1346	1446	1457	1557	4.5	53.7	-	63.6	0	5250
C-473	11 Sep	1513	1613	1617	1717	2.3	65.8	-	76.3	270	870
		1548	1648	1623	1723	4.5	71.5	-	77.2	0	840
C-474	13 Sep	0914	1014	1100	1200	2.3	51.8	-	44.6	30	5490
		1104	1204	1301	1401	4.5	44.5	44.4	49.5	0	5460
C-475	15 Sep	1301	1401	1458	1558	2.3	49.3	-	60.1	150	6180
		1506	1606	1652	1752	4.5	61.0	-	76.5	180	6150
C-476	16 Sep	1050	1150	1255	1355	2.3	50.2	48.3	49.4	150	6180
		1301	1401	1451	1551	4.5	49.7	-	59.6	180	6150
C-477	18 Sep	1103	1203	1211	1311	2.3	50.7	49.0	49.1	120	3480
		1222	1322	1334	1434	4.5	49.2	-	52.7	120	3480
C-478	25 Sep	1346	1446	1505	1605	2.3	64.4	-	73.8	150	6150
		1512	1612	1615	1715	4.5	74.7	-	83.4	180	6060
C-479	26 Sep	0926	1026	1105	1205	2.3	59.6	-	55.9	120	4620
		1109	1209	1251	1351	4.5	55.9	-	59.9	150	4590

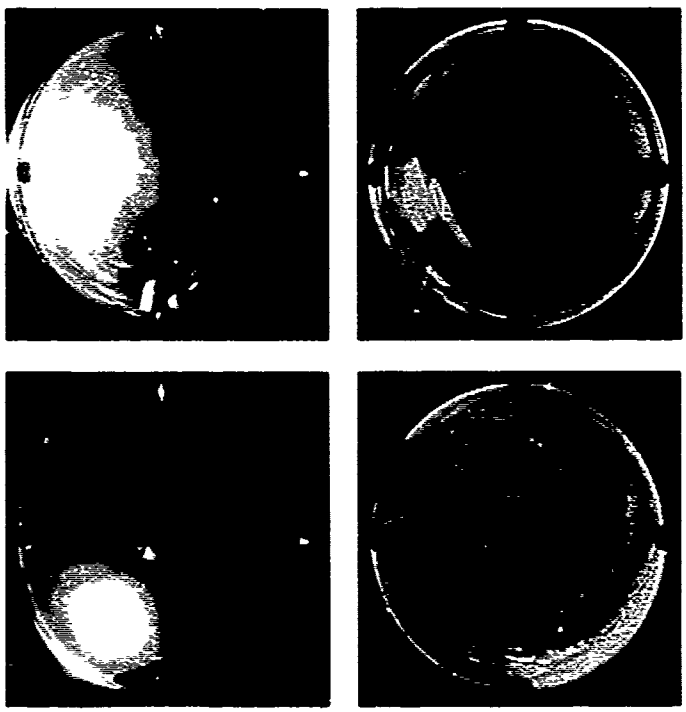


FLIGHT C-462
Trapani Track

Upper and Lower Hemisphere
272 m AGL 1052 GMT

Upper and Lower Hemisphere
6186 m AGL 1215 GMT

Fig. 7-1 Typical Sky and Terrain Photographs for Flights C-462 and C-476



FLIGHT C-476
Yeovilton Track

Upper and Lower Hemisphere
350 m AGL 1304 GMT

Upper and Lower Hemisphere
6263 m AGL 1427 GMT

FLIGHT C-473
Birkhof Track

Upper and Lower Hemisphere
288 m AGL 1512 GMT

Upper and Lower Hemisphere
891 m AGL 1529 GMT

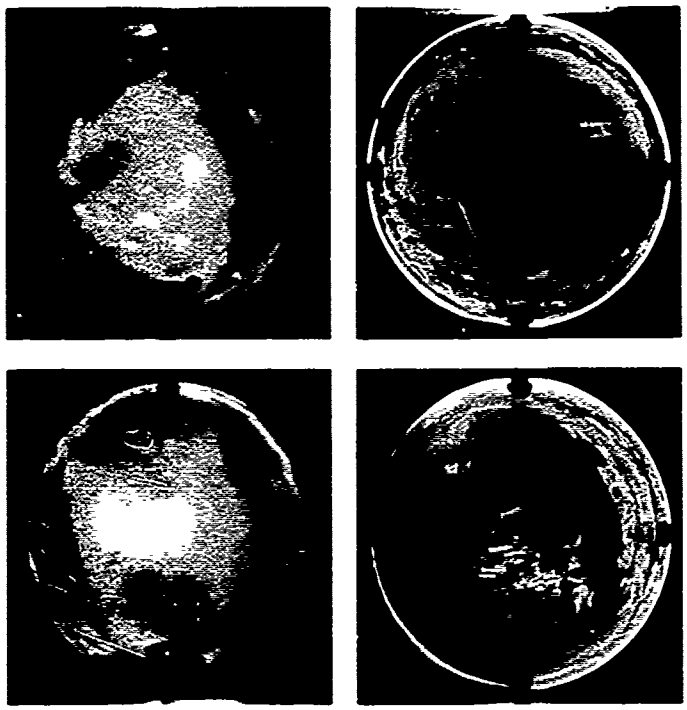
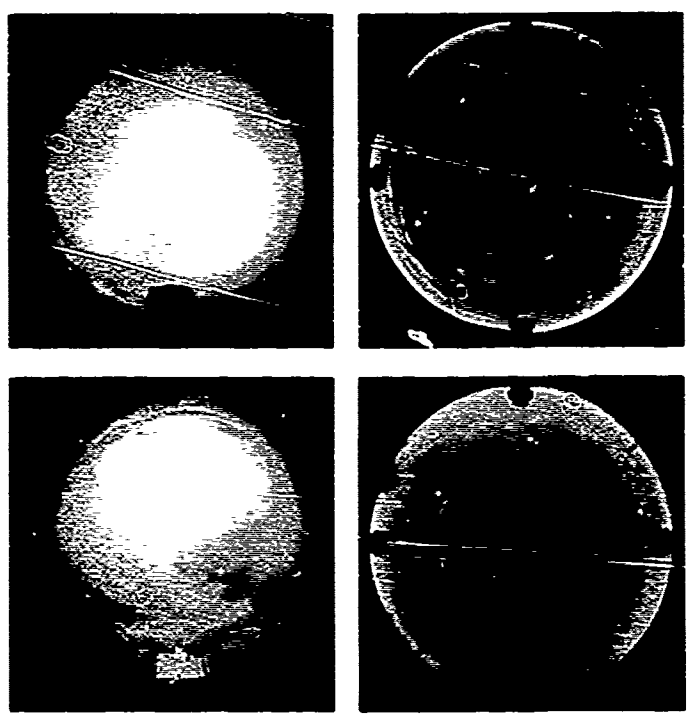


Fig. 7-2 Typical Sky and Terrain Photographs for Flights C-473 and C-465

FLIGHT C-465
Meppen Track

Upper and Lower Hemisphere
267 m AGL 1439 GMT

Upper and Lower Hemisphere
1587 m AGL 1458 GMT



The total volume scattering coefficient, equivalent attenuation length and radiance (beam) transmittance data are presented both tabularly and graphically in Section 7.3. The downwelling irradiance data are presented graphically only. All of the data are grouped into sets by flight number. A detailed description of the flight and a report of the existing weather conditions are given as the introductory page to each data set.

Users should be alert to the fact that the data collected on ascents are taken in two or three segments separated in time by the straight and level flight elements. Thus, the consecutive segments of these V-PROS may be separated by as much as 10 to 15 minutes in time. For more specific discusssion of these and other profile characteristics, the user is referred to Section 8.2.

7.2. DESCRIPTION OF AIRBORNE DATA TABLES AND GRAPHS

DATA TABLES

Data are presented in tables of:

Total Volume Scattering Coefficient
Equivalent Attenuation Length
Radiance (Beam) Transmittance Between Ground and Altitude

Each optical property is tabulated as a function of altitude above ground level. The data are further divided by optical filter and are given in order of increasing wavelength.

The tables have been divided into two categories depending upon the meaning of the altitude in the tables, (1) the variable tabulated by measurement altitude: total volume scattering coefficient, and (2) the variables tabulated by target or sensor altitude depending on whether the path of sight is upward or downward: equivalent attenuation length, and radiance (beam) transmittance.

CATEGORY I: MEASUREMENT ALTITUDE

Total Volume Scattering Coefficient. The total volume scattering coefficient $s(z)$ is tabulated by measurement altitude in one to four columns, one for each optical filter. The altitude is given in meters, above ground level, at 30 meter (98.4-foot) increments. The unit for the total scattering coefficient is m^{-1}. Those data values that were extrapolated above and below the altitude limits of measurement are indicated by parentheses.

The first and last data altitudes are given at the bottom of the total scattering coefficient table. These are the lowest and highest altitudes of airborne data measurements.

The total scattering coefficient is used for the calculation of atmospheric radiance (beam) transmittance and equivalent attenuation length in the ensuing tables using the equations of Section 2.

CATEGORY II: TARGET OR SENSOR ALTITUDE

These variables are tabulated by target or sensor altitude depending upon whether the path of sight is upward or downward. For upward paths of sight $\theta < 90°$ the sensor is at ground level and the altitudes shown in the table are the target altitudes. For the downward paths of sight $\theta > 90°$, the target is at ground level and the altitudes in the table are the sensor altitudes.

Equivalent Attenuation Length. The equivalent attenuation length $\bar{\ell}(z)$ is a pseudo-attenuation length which, when combined with its altitude z, can be used directly in Eq. (2.6) to compute radiance (beam) transmittance The equivalent attenuation length permits easy calculation of the atmospheric radiance (beam) transmittance between ground level and altitude z above ground level for any downward path of sight from 95 degrees to 180 degrees in zenith angle or between altitude and ground level for any upward path of sight from 0 degrees to 85 degrees in zenith angle.

The equivalent attenuation length $\bar{\ell}(z)$ is tabulated by altitude for the path of sight between ground and the altitude shown in one to four columns for the optical filters. The altitude is given in meters above ground level, at 300-meter (984-foot) increments. The unit for the equivalent attenuation length is "m."

Radiance (Beam) Transmittance Between Ground and Altitude. The atmospheric radiance (beam) transmittance is tabulated for the vertically upward path of sight $T_z(0, 0°)$ or the vertically downward path of sight $T_z(z, 180°)$ for the path of sight between ground and the altitude shown. The radiance (beam) transmittance is computed from measurements of total scattering coefficient. The assumption is made that there is no significant atmospheric absorption in the pass bands of the measurements, hence the atmospheric attenuation coefficient $\alpha(z)$ is assumed equivalent to the scattering coefficient $s(z)$.

The vertical radiance (beam) transmittance is tabulated by altitude for the path of sight between ground and the altitude shown in one to four columns, one for each the optical filter. The altitude is given in meters above ground level, at 300-meter (984-foot) increments. This property is dimensionless.

DATA GRAPHS

Data are also presented in graphs of:

Total Volume Scattering Coefficient
Equivalent Attenuation Length, Between Ground and Altitude
Vertical Radiance (Beam) Transmittance, Between Ground and Altitude
Downwelling Irradiance

Total Volume Scattering Coefficient. The total volume scattering coefficient $s(z)$ in m^{-1} is graphed using a single average value for each 30-meter altitude interval. Identifying symbols for the spectral filters appear every fifth data point, or at 150-meter intervals. These same data were tabulated in the total scattering coefficient table. The extrapolated values are indicated by a dashed line.

Equivalent Attenuation Length. The equivalent attenuation length $\bar{\ell}(z)$ in meters, for the path between ground and altitude, is graphed for each 30-meter altitude interval. This represents smaller altitude increments than in the tabular display of equivalent attenuation length. Spectral identifying symbols appear at 150-meter intervals or every fifth data point.

Vertical Radiance (Beam) Transmittance Between Ground and Altitude. The vertical radiance (beam) transmittance $T_r(0, 0°)$ or $T_r(z, 180°)$ between ground and altitude is graphed for each 30-meter altitude interval. This represents smaller altitude increments than in the tabular display of beam transmittance. Spectral identifying symbols appear at 150-meter intervals or every fifth data point.

Downwelling Irradiance. The downwelling irradiance $E(z,d)$ is graphed as a function of altitude above ground level (AGL). These irradiances were measured by the dual irradiometer concurrently with the total volume scattering coefficient measurements. The downwelling irradiance during the ascent or descent is graphed using a single average value for each 30-meter altitude interval and the identifying symbol for the spectral filter appears every fifth data point; thus when data are continuous the symbols appear at 150-meter intervals. The second symbol for each filter designates the average value measured during each three-minute straight and level flight element.

7.3. PRESENTATION OF AIRBORNE DATA

Tabular listings and graphical displays of the data discussed in Section 7.2 are presented in the pages immediately following. *Users should be aware that regardless of the display format, the data values are valid to, at best, only three significant figures. The tables of radiance (beam) transmittance, in particular, should be rounded off to 2 digits prior to further application.*

It should also be remembered that all values in the data tables except scattering coefficient are computed values based upon the measured values of scattering coefficient.

All altitudes presented in the data tables, in the flight description, and in the graphs are given as above ground level (AGL) unless otherwise specified.

These data from the OPAQUE V deployment have been edited more heavily than those from the preceding four OPAQUE deployments as noted briefly in Section 3. The edits have involved the deletion of spurious data segments and their replacement with values linearly interpolated over the replacement interval. The resulting artifact in the graphical display is a straight line segment without variation, but containing the coding symbol for optical filter at the typical 150m interval. *e.g.* flight C-462, total volume scattering coefficient, Filter 4 at approximately 1.1 km to 1.4 km AGL.

The irradiance data has been edited by simply deleting the unreliable data segments with no replacement. These data segments have typically been intervals measured on descents below approximately 4.0 km. *e.g.* flight C-462, irradiance, Filters 3 and 5, at all altitudes below 4.0 km AGL.

FLIGHT C-460 - 2 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1142	1314	1.53	20.6	-	32.7	120	6210
4,5	1350	1500	1 17	39.1	-	52.9	150	6090

Flight Description. Flight C-460 was essentially an afternoon flight with take off at 1034 GMT and landing at 1550 GMT. Collection of data began shortly before noon. Skies were clear with several haze layers. The approximate northwest to southeast Trapani track was located west of Sicily. The flight consisted of V-PRO's over shallow water in the Strait of Sicily. Typical terrain features along the nearby coast east of the track were brown and green rolling fields.

In-Flight Notes. The in-flight observer reported clear skies with a slant range visibility of 30.4 kilometers (19 miles) at 300 meters (1000 feet) at 1143 GMT. During the climb out there was continuous haze to 3600 meters (12,000 feet) and more haze above. Surface visibility was 8-11.2 kilometers (5-7 miles) with the slant range visibility slightly greater. During the V-PRO's the haze was very consistent with haze layers apparently to just above us to about 6300 or 6600 meters (21,000 or 22,000 feet) Some structure was visible looking near horizontal but haze was still above Below 6000 meters (20,000 feet) no structure was apparent with moderate haze throughout. There was no change with time that was apparent. On the last descent there was the same weak structure and layering between 4800 and 5400 meters (16,000 and 18,000 feet) with thinning above. The top of the haze was still above 6000 meters (20,000 feet) At 1210 GMT at 3600 meters (6000 feet) the slant range visibility was 27.2 kilometers (17 miles).

Local Weather Notes. Trapani, 41.8 kilometers northeast of the track center, reported clear skies from 1000 to 1600 GMT. Visibility values were missing except for a report of 16.0 kilometers at 1500 GMT.

Pantelleria, an island 93.5 kilometers southwest of the track, reported clear skies between 0900 and 1600 GMT with visibility 8 0 kilometers in haze and light fog.

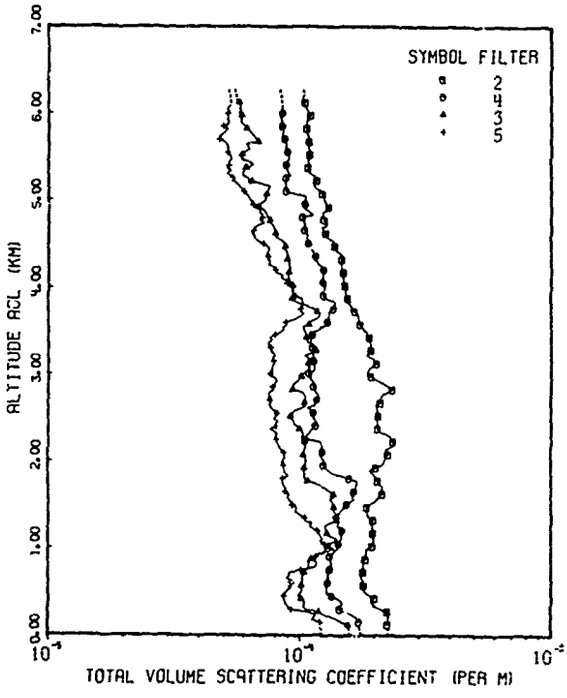
Palermo, 89.8 kilometers east of the track center, also had clear skies between 1020 and 1350 GMT. Most of the visibility values were not reported but at 1200 GMT it was 14 kilometers and at 1500 GMT it was 11 kilometers.

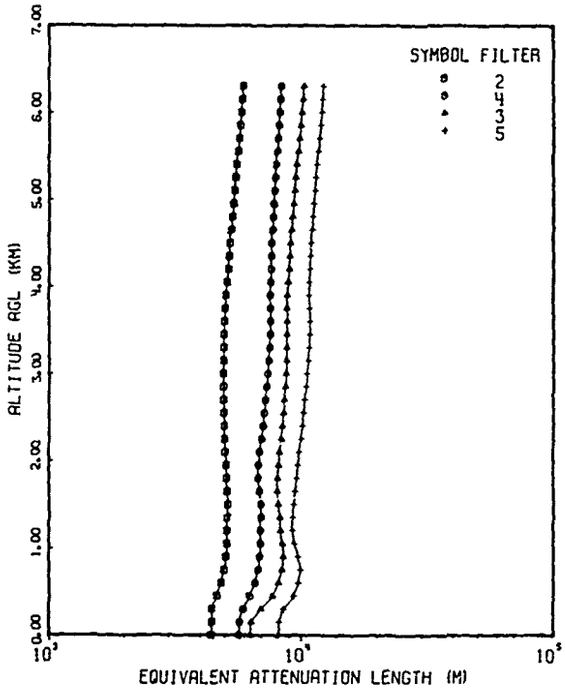
The radiosonde station was northeast near Rome 473 kilometers from the track. The sounding showed no clouds and moderate westerly winds at 1200 GMT which placed it in a parallel flow to the track.

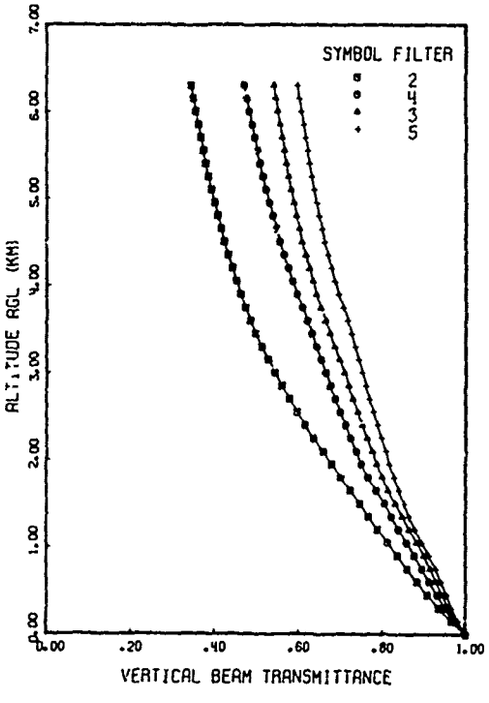
Synoptic Remarks. The 0000 GMT surface chart showed a frontal system 15° west of Ireland. There was a 1004 millibar low in southern Great Britain. There was another low over northwestern Africa. A high pressure area centered near 53°N 32°E had a ridge southsouthwest to Sicily. There was generally weak gradient over western Europe with no frontal activity. At 1200 GMT the gradient remained very weak over western Europe and the low centered over southern Great Britain was filling. The frontal system was 10° west of Ireland and there was little change in the high pressure area. Ridging continued over Sicily and Italy. The pressure gradient over Sicily was weak with light surface winds. At 500 millibars a ridge of high pressure enveloped North Africa and the southern Mediterranean with the track in moderate westerly flow. There was also a closed low over southeastern England at 0000 GMT. By 1200 GMT there was a closed high over Sicily, Tunisia and northern Libya with moderate westerly flow over the track. The satellite maps indicated that both Sicily and Italy were experiencing clear skies. The computer printouts for both 0900 and 1200 GMT showed clear skies and 10 kilometer visibility. The air mass was maritime polar.

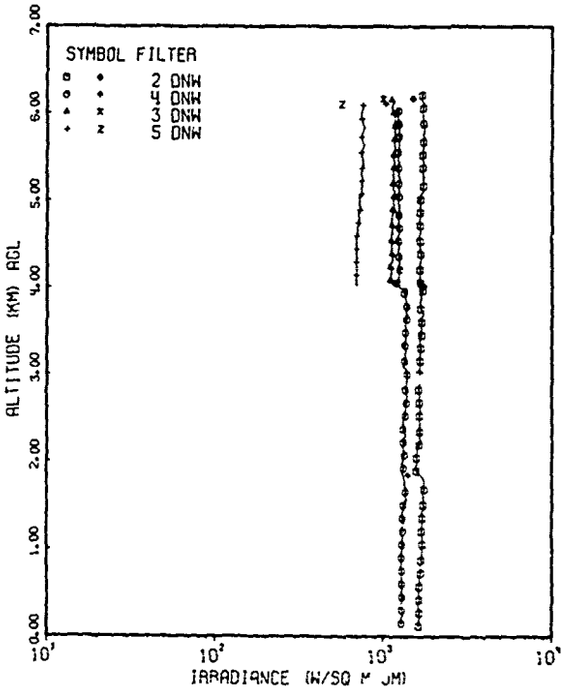
FLIGHT NO. C-460

TRAPANI









FLIGHT NO. C-460
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4175 DATE 05/27/80)
DATE 80278 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.27E-04)	(1.76E-04)	(1.59E-04)	(1.23E-04)
30	(2.26E-04)	(1.75E-04)	(1.58E-04)	(1.22E-04)
60	(2.25E-04)	(1.75E-04)	(1.58E-04)	(1.22E-04)
90	(2.25E-04)	(1.74E-04)	(1.57E-04)	(1.21E-04)
120	2.24E-04	(1.74E-04)	1.57E-04	(1.21E-04)
150	2.25E-04	1.73E-04	1.49E-04	1.21E-04
180	2.26E-04	1.72E-04	1.43E-04	1.12E-04
210	2.26E-04	1.68E-04	1.34E-04	1.15E-04
240	2.27E-04	1.62E-04	1.25E-04	1.15E-04
270	2.24E-04	1.51E-04	1.20E-04	1.04E-04
300	2.12E-04	1.45E-04	1.07E-04	9.31E-05
330	2.00E-04	1.41E-04	1.04E-04	9.00E-05
360	1.96E-04	1.48E-04	1.04E-04	8.75E-05
390	1.94E-04	1.47E-04	1.04E-04	8.71E-05
420	1.98E-04	1.42E-04	1.01E-04	8.58E-05
450	1.91E-04	1.34E-04	9.83E-05	8.63E-05
480	1.85E-04	1.29E-04	1.01E-04	8.77E-05
510	1.80E-04	1.28E-04	1.02E-04	8.92E-05
540	1.80E-04	1.29E-04	1.02E-04	9.17E-05
570	1.80E-04	1.29E-04	1.01E-04	9.08E-05
600	1.79E-04	1.29E-04	1.02E-04	9.24E-05
630	1.78E-04	1.31E-04	1.03E-04	9.10E-05
660	1.76E-04	1.30E-04	1.03E-04	8.93E-05
690	1.77E-04	1.30E-04	1.04E-04	9.14E-05
720	1.79E-04	1.30E-04	1.04E-04	9.10E-05
750	1.79E-04	1.32E-04	1.06E-04	1.01E-04
780	1.79E-04	1.33E-04	1.09E-04	1.16E-04
810	1.80E-04	1.34E-04	1.08E-04	1.17E-04
840	1.78E-04	1.34E-04	1.09E-04	1.17E-04
870	1.83E-04	1.34E-04	1.11E-04	1.13E-04
900	1.84E-04	1.32E-04	1.15E-04	1.16E-04
930	1.84E-04	1.36E-04	1.19E-04	1.20E-04
960	1.85E-04	1.37E-04	1.25E-04	1.29E-04
990	1.85E-04	1.42E-04	1.28E-04	1.37E-04
1020	1.94E-04	1.42E-04	1.30E-04	1.29E-04
1050	1.98E-04	1.43E-04	1.32E-04	1.25E-04
1080	1.98E-04	1.46E-04	1.39E-04	1.21E-04
1110	1.98E-04	1.48E-04	1.41E-04	1.23E-04
1140	1.97E-04	1.47E-04	1.30E-04	1.21E-04
1170	1.96E-04	1.47E-04	1.28E-04	1.19E-04
1200	1.94E-04	1.47E-04	1.28E-04	1.17E-04
1230	1.96E-04	1.45E-04	1.26E-04	1.12E-04
1260	1.96E-04	1.41E-04	1.27E-04	1.10E-04
1290	1.93E-04	1.42E-04	1.33E-04	1.11E-04
1320	1.95E-04	1.41E-04	1.40E-04	1.04E-04
1350	1.89E-04	1.39E-04	1.41E-04	1.04E-04
1380	1.86E-04	1.38E-04	1.41E-04	1.00E-04
1410	1.86E-04	1.45E-04	1.38E-04	9.65E-05
1440	1.85E-04	1.48E-04	1.36E-04	9.65E-05
1470	1.85E-04	1.50E-04	1.36E-04	9.67E-05
1500	1.90E-04	1.53E-04	1.35E-04	9.31E-05

FLIGHT NO. C-460
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4175 DATE 05/27/80)
DATE 80278 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.99E-04	1.58E-04	1.34E-04	9.26E-05
1560	2.03E-04	1.64E-04	1.31E-04	8.99E-05
1590	2.08E-04	1.63E-04	1.37E-04	8.96E-05
1620	2.13E-04	1.61E-04	1.36E-04	9.04E-05
1650	2.16E-04	1.65E-04	1.32E-04	8.75 -05
1680	2.12E-04	1.66E-04	1.27E-04	8.79E-05
1710	2.14E-04	1.68E-04	1.22E-04	8.63E-05
1740	2.08E-04	1.70E-04	1.16E-04	8.61E-05
1770	2.04E-04	1.69E-04	1.07E-04	8.52E-05
1800	2.03E-04	1.57E-04	1.05E-04	8.55E-05
1830	1.99E-04	1.45E-04	1.04E-04	9.02E-05
1860	1.95E-04	1.35E-04	1.04E-04	8.76E-05
1890	1.91E-04	1.31E-04	1.04E-04	8.72E-05
1920	2.01E-04	1.27E-04	1.04E-04	8.65E-05
1950	2.12E-04	1.24E-04	1.05E-04	8.65E-05
1980	2.18E-04	1.24E-04	1.06E-04	8.50E-05
2010	2.18E-04	1.25E-04	1.06E-04	8.59E-05
2040	2.22E-04	1.22E-04	1.05E-04	8.77E-05
2070	2.25E-04	1.22E-04	1.04E-04	8.73E-05
2100	2.27E-04	1.23E-04	1.04E-04	8.68E-05
2130	2.20E-04	1.23E-04	1.05E-04	8.48E-05
2160	2.31E-04	1.23E-04	1.06E-04	8.25E-05
2190	2.38E-04	1.21E-04	1.04E-04	8.15E-05
2220	2.34E-04	1.20E-04	1.04E-04	8.04E-05
2250	2.29E-04	1.04E-04	1.03E-04	8.04E-05
2280	2.29E-04	1.04E-04	1.02E-04	7.99E-05
2310	2.20E-04	1.09E-04	1.02E-04	8.11E-05
2340	2.07E-04	1.10E-04	1.02E-04	7.90E-05
2370	2.03E-04	1.12E-04	9.95E-05	7.62E-05
2400	2.04E-04	1.15E-04	9.72E-05	8.02E-05
2430	2.03E-04	1.16E-04	9.40E-05	7.95E-05
2460	2.03E-04	1.15E-04	9.40E-05	8.14E-05
2490	2.03E-04	1.13E-04	9.22E-05	7.89E-05
2520	2.05E-04	1.13E-04	9.15E-05	8.02E-05
2550	2.06E-04	1.13E-04	9.33E-05	8.13E-05
2580	2.04E-04	1.11E-04	9.52E-05	7.91E-05
2610	2.02E-04	1.06E-04	1.01E-04	7.68E-05
2640	2.01E-04	1.15E-04	1.05E-04	7.58E-05
2670	2.09E-04	1.17E-04	1.04E-04	7.68E-05
2700	2.10E-04	1.16E-04	1.04E-04	7.61E-05
2730	2.10E-04	1.16E-04	1.04E-04	7.50E-05
2760	2.13E-04	1.18E-04	1.03E-04	7.53E-05
2790	2.24E-04	1.15E-04	1.02E-04	7.56E-05
2820	2.33E-04	1.14E-04	9.31E-05	7.89E-05
2850	2.25E-04	1.12E-04	9.35E-05	7.78E-05
2880	2.18E-04	1.13E-04	9.36E-05	7.94E-05
2910	2.10E-04	1.12E-04	9.72E-05	8.08E-05
2940	1.99E-04	1.09E-04	9.89E-05	7.99E-05
2970	1.91E-04	1.09E-04	1.01E-04	7.76E-05
3000	1.85E-04	1.08E-04	1.03E-04	7.62E-05

FLIGHT NO. C-460
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4175 DATE 05/27/80)
DATE 80278 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	1.88E-04	1.13E-04	1.07E-04	7.80E-05
3060	1.90E-04	1.14E-04	1.09E-04	7.73E-05
3090	1.94E-04	1.14E-04	1.08E-04	7.78E-05
3120	2.01E-04	1.13E-04	1.03E-04	7.92E-05
3150	1.99E-04	1.13E-04	1.08E-04	7.83E-05
3180	1.97E-04	1.13E-04	1.09E-04	7.78E-05
3210	1.85E-04	1.13E-04	1.05E-04	7.97E-05
3240	1.90E-04	1.12E-04	1.12E-04	7.80E-05
3270	1.91E-04	1.13E-04	1.16E-04	7.64E-05
3300	1.91E-04	1.11E-04	1.16E-04	7.65E-05
3330	1.91E-04	1.11E-04	1.13E-04	7.47E-05
3360	1.90E-04	1.10E-04	1.08E-04	7.48E-05
3390	1.90E-04	1.11E-04	1.06E-04	7.77E-05
3420	1.89E-04	1.11E-04	1.06E-04	7.58E-05
3450	1.85E-04	1.12E-04	1.05E-04	7.97E-05
3480	1.84E-04	1.12E-04	1.05E-04	8.36E-05
3510	1.80E-04	1.20E-04	1.03E-04	8.61E-05
3540	1.77E-04	1.22E-04	1.03E-04	8.57E-05
3570	1.74E-04	1.29E-04	1.09E-04	8.91E-05
3600	1.72E-04	1.28E-04	1.10E-04	8.78E-05
3630	1.72E-04	1.28E-04	1.15E-04	9.57E-05
3660	1.71E-04	1.30E-04	1.20E-04	9.92E-05
3690	1.70E-04	1.30E-04	1.19E-04	1.03E-04
3720	1.65E-04	1.31E-04	1.17E-04	1.01E-04
3750	1.62E-04	1.36E-04	1.14E-04	1.01E-04
3780	1.60E-04	1.37E-04	1.08E-04	1.03E-04
3810	1.57E-04	1.39E-04	1.01E-04	1.02E-04
3840	1.56E-04	1.37E-04	9.50E-05	1.03E-04
3870	1.56E-04	1.28E-04	9.36E-05	1.02E-04
3900	1.54E-04	1.24E-04	9.47E-05	9.60E-05
3930	1.53E-04	1.24E-04	9.41E-05	9.44E-05
3960	1.52E-04	1.24E-04	9.36E-05	9.27E-05
3990	1.51E-04	1.25E-04	9.38E-05	9.29E-05
4020	1.51E-04	1.24E-04	9.33E-05	9.02E-05
4050	1.49E-04	1.23E-04	9.29E-05	8.87E-05
4080	1.49E-04	1.23E-04	9.01E-05	8.84E-05
4110	1.48E-04	1.23E-04	8.98E-05	8.43E-05
4140	1.48E-04	1.23E-04	8.97E-05	8.52E-05
4170	1.48E-04	1.23E-04	8.99E-05	8.03E-05
4200	1.46E-04	1.23E-04	9.10E-05	7.97E-05
4230	1.46E-04	1.23E-04	9.08E-05	7.86E-05
4260	1.46E-04	1.18E-04	9.07E-05	7.49E-05
4290	1.46E-04	1.17E-04	9.03E-05	7.59E-05
4320	1.47E-04	1.15E-04	8.90E-05	7.51E-05
4350	1.46E-04	1.15E-04	9.00E-05	7.45E-05
4380	1.46E-04	1.14E-04	8.84E-05	7.34E-05
4410	1.41E-04	1.12E-04	8.33E-05	7.42E-05
4440	1.37E-04	1.10E-04	8.68E-05	7.58E-05
4470	1.37E-04	1.09E-04	8.75E-05	7.42E-05
4500	1.37E-04	1.08E-04	8.61E-05	7.13E-05

FLIGHT NO. C-460
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4175 DATE 05/27/80)
DATE 80278 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	1.36E-04	1.07E-04	8.59E-05	6.76E-05
4560	1.31E-04	1.07E-04	8.23E-05	6.61E-05
4590	1.28E-04	1.07E-04	7.98E-05	6.56E-05
4620	1.26E-04	1.05E-04	7.98E-05	6.41E-05
4650	1.24E-04	1.04E-04	7.95E-05	6.52E-05
4680	1.22E-04	1.04E-04	7.85E-05	6.61E-05
4710	1.27E-04	1.04E-04	7.74E-05	6.78E-05
4740	1.27E-04	1.03E-04	7.54E-05	7.20E-05
4770	1.24E-04	1.04E-04	7.59E-05	6.89E-05
4800	1.25E-04	1.02E-04	7.41E-05	7.07E-05
4830	1.22E-04	1.12E-04	7.34E-05	7.03E-05
4860	1.23E-04	1.09E-04	7.23E-05	6.86E-05
4890	1.28E-04	1.05E-04	7.13E-05	6.92E-05
4920	1.29E-04	1.02E-04	6.81E-05	6.55E-05
4950	1.29E-04	1.04E-04	6.89E-05	6.48E-05
4980	1.26E-04	1.05E-04	7.15E-05	6.43E-05
5010	1.24E-04	1.05E-04	7.30E-05	6.32E-05
5040	1.23E-04	1.05E-04	7.31E-05	6.20E-05
5070	1.22E-04	9.62E-05	7.33E-05	6.08E-05
5100	1.21E-04	8.74E-05	7.34E-05	5.96E-05
5130	1.16E-04	8.75E-05	7.49E-05	5.84E-05
5160	1.14E-04	8.76E-05	7.61E-05	5.72E-05
5190	1.15E-04	8.74E-05	6.97E-05	5.60E-05
5220	1.16E-04	8.74E-05	6.38E-05	5.48E-05
5250	1.15E-04	8.75E-05	6.18E-05	5.36E-05
5280	1.13E-04	9.13E-05	5.91E-05	5.27E-05
5310	1.09E-04	8.98E-05	5.95E-05	5.15E-05
5340	1.08E-04	8.89E-05	6.00E-05	5.35E-05
5370	1.07E-04	8.79E-05	5.09E-05	5.12E-05
5400	1.09E-04	8.79E-05	6.48E-05	5.24E-05
5430	1.08E-04	8.81E-05	6.37E-05	5.22E-05
5460	1.09E-04	9.03E-05	5.90E-05	5.36E-05
5490	1.10E-04	9.01E-05	5.80E-05	5.31E-05
5520	1.09E-04	8.99E-05	5.86E-05	5.25E-05
5550	1.10E-04	8.88E-05	6.04E-05	5.15E-05
5580	1.08E-04	8.75E-05	6.25E-05	5.17E-05
5610	1.07E-04	8.75E-05	6.16E-05	5.13E-05
5640	1.08E-04	8.75E-05	6.08E-05	5.09E-05
5670	1.06E-04	8.75E-05	5.81E-05	5.00E-05
5700	1.08E-04	8.67E-05	6.67E-05	4.78E-05
5730	1.08E-04	8.50E-05	6.53E-05	4.81E-05
5760	1.06E-04	8.48E-05	6.39E-05	4.93E-05
5790	1.06E-04	8.55E-05	6.25E-05	5.04E-05
5820	1.06E-04	8.45E-05	6.11E-05	5.16E-05
5850	1.06E-04	8.45E-05	5.97E-05	4.95E-05
5880	1.06E-04	8.43E-05	5.83E-05	5.21E-05
5910	1.06E-04	8.42E-05	5.81E-05	5.18E-05
5940	1.09E-04	8.39E-05	5.84E-05	5.15E-05
5970	1.09E-04	8.30E-05	5.83E-05	5.15E-05
6000	1.07E-04	8.46E-05	5.69E-05	5.15E-05

FLIGHT NO. C-460
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4175 DATE 05/27/80)
DATE 80278 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	1.06E-04	8.51E-05	5.79E-05	5.22E-05
6060	1.06E-04	(8.48E-05)	5.75E-05	5.15E-05
6090	1.03E-04	(8.46E-05)	5.76E-05	5.31E-05
6120	1.04E-04	(8.43E-05)	5.71E-05	(5.30E-05)
6150	1.03E-04	(8.40E-05)	5.57E-05	(5.28E-05)
6180	1.02E-04	(8.38E-05)	(5.55E-05)	(5.26E-05)
6210	1.04E-04	(8.35E-05)	(5.54E-05)	(5.24E-05)
6240	(1.03E-04)	(8.32E-05)	(5.52E-05)	(5.23E-05)
6270	(1.03E-04)	(8.29E-05)	(5.50E-05)	(5.21E-05)
6300	(1.03E-04)	(8.27E-05)	(5.48E-05)	(5.19E-05)
FIRST DATA ALT	120	150	120	150
LAST DATA ALT	6210	6030	6150	6090

FLIGHT NO. C-460
EQUIVALENT ATTENUATION LENGTH

(JOB 4175 DATE 05/27/80)
DATE 80272 FLIGHT NO. C-460 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	4.41E 03	5.69E 03	5.23E 03	8.15E 03
300	4.45E 03	5.93E 03	6.98E 03	8.57E 03
600	4.82E 03	6.56E 03	8.15E 03	9.73E 03
900	5.05E 03	6.87E 03	8.52E 03	9.72E 03
1200	5.09E 03	6.90E 03	8.31E 03	9.25E 03
1500	5.12E 03	6.91E 03	8.11E 03	9.33E 03
1800	5.07E 03	6.76E 03	8.08E 03	9.61E 03
2100	5.03E 03	6.88E 03	8.26E 03	9.84E 03
2400	4.95E 03	7.07E 03	8.42E 03	1.01E 04
2700	4.95E 03	7.23E 03	8.59E 03	1.03E 04
3000	4.92E 03	7.36E 03	8.72E 03	1.05E 04
3300	4.95E 03	7.48E 03	8.76E 03	1.07E 04
3600	4.98E 03	7.57E 03	8.81E 03	1.08E 04
3900	5.05E 03	7.56E 03	8.84E 03	1.08E 04
4200	5.14E 03	7.60E 03	8.96E 03	1.08E 04
4500	5.24E 03	7.66E 03	9.08E 03	1.09E 04
4800	5.35E 03	7.76E 03	9.24E 03	1.11E 04
5100	5.45E 03	7.85E 03	9.43E 03	1.13E 04
5400	5.57E 03	7.99E 03	9.63E 03	1.15E 04
5700	5.69E 03	8.11E 03	9.84E 03	1.18E 04
6000	5.80E 03	8.24E 03	1.00E 04	1.20E 04
6300	5.92E 03	8.36E 03	1.03E 04	1.23E 04

FLIGHT NO. C-460
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.35E-01	9.51E-01	9.58E-01	9.66E-01
600	8.83E-01	9.13E-01	9.29E-01	9.40E-01
900	8.37E-01	8.77E-01	9.00E-01	9.12E-01
1200	7.90E-01	8.40E-01	8.65E-01	8.78E-01
1500	7.46E-01	8.05E-01	8.31E-01	8.51E-01
1800	7.01E-01	7.66E-01	8.00E-01	8.29E-01
2100	6.58E-01	7.37E-01	7.76E-01	8.08E-01
2400	6.16E-01	7.12E-01	7.52E-01	7.88E-01
2700	5.76E-01	6.88E-01	7.30E-01	7.70E-01
3000	5.44E-01	6.65E-01	7.09E-01	7.52E-01
3300	5.13E-01	6.43E-01	6.85E-01	7.35E-01
3600	4.86E-01	6.21E-01	6.55E-01	7.17E-01
3900	4.62E-01	5.97E-01	6.43E-01	6.96E-01
4200	4.42E-01	5.75E-01	6.26E-01	6.78E-01
4500	4.23E-01	5.56E-01	6.09E-01	6.63E-01
4800	4.07E-01	5.39E-01	5.95E-01	6.49E-01
5100	3.92E-01	5.22E-01	5.82E-01	6.37E-01
5400	3.79E-01	5.09E-01	5.71E-01	6.26E-01
5700	3.67E-01	4.95E-01	5.60E-01	6.17E-01
6000	3.56E-01	4.83E-01	5.50E-01	6.08E-01
6300	3.45E-01	4.71E-01	5.41E-01	5.98E-01

FLIGHT C-461 - 3 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0858	1037	1.65	34 2	-	20.7	90	4680
4,5	1043	1206	1 38	20.4	19 9	24 2	120	4320

Flight Description. Flight C-461 was a midday flight spanning local apparent noon with take off at 0756 and landing at 1247 GMT. There were broken middle and high clouds. The approximate northwest to southeast Trapani track was located west of Sicily. Typical terrain features along the nearby coast were brown and green rolling fields. Directly below the track were the relatively shallow waters of the Strait of Sicily.

In-Flight Notes. The in-flight observer reported very thin clouds during the first sun mode at 0858 GMT becoming slightly thicker during the second sun mode at 300 meters (1000 feet). The 7/8 cloud cover was composed of cirrostratus, altostratus and altocumulus with visibility 24 kilometers (15 miles) in haze. The same conditions existed at 1500 meters (5000 feet) at 0928 GMT. At 0950 GMT at 2700 meters (9000 feet) the sky cover was 6/8. At 4500 meters (15,000 feet) at 1014 GMT the sky cover was 5/8 and we were very near the top of the haze layer, it was still clear below. The sun coverage was not as uniform due to Ac spacing. By 1045 GMT it seemed clearer below 300 meters (1000 feet) than above; a dark layer was observable apparently above our flight level. This is seen over the island but not over the water - may be smoke trapped by marine inversion. Also at 1045 GMT there were 4/8 Ac/Cs with 32 kilometers (20 miles) slant range visibility in haze at 300 meters (1000 feet). At 1105 GMT 2100 meters (7000 feet) there was 5/8 cloud cover and 16 kilometers (10 miles) slant range visibility. The clouds were becoming more variable in density. During the first sun mode - clear sun; second - probably thin cloud. At 1140 GMT at 4200 meters (14,000 feet) there was 6/8 sky cover slant range visibility of 32 kilometers (20 miles) with haze. Visibility is apparently better than previous.

Local Weather Notes. Trapani, 40.8 kilometers northeast of the track center, reported 6/8 altocumulus at 2700 meters (9000 feet) and 7/8 cirrus with height undefined. Visibility was missing. By 1200 GMT there was 2/8 altocumulus at 3000 meters (10,000 feet) 5/8 high cirrus and 14 kilometers visibility

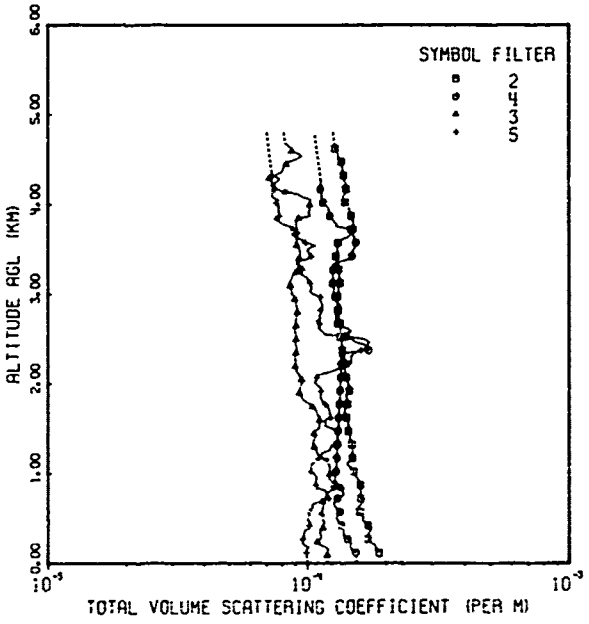
Pantelleria, an island 93.5 kilometers southwest of the track, reported 2/8 to 3/8 high cirrus during the morning with 10 kilometers visibility at 1200 GMT.

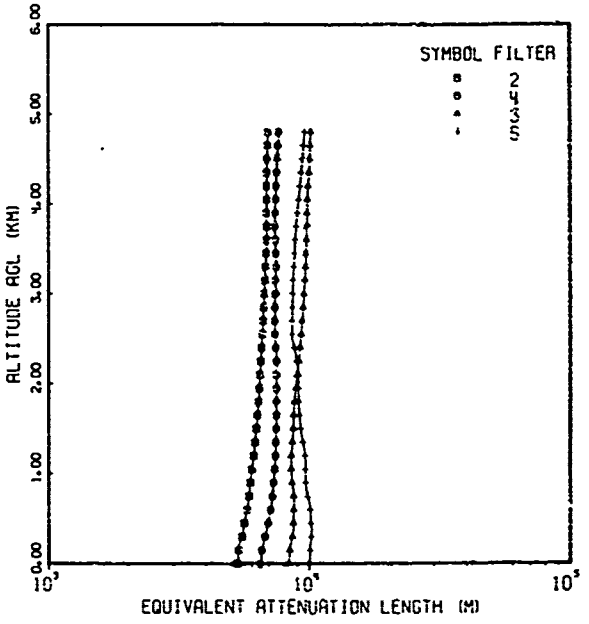
Palermo, 88 8 kilometers east of the track, reported 3/8 high cirrus and 8 kilometers visibility in light fog at 0900 GMT. Cirrus decreased to 1/8 by 1100 GMT. At 1200 and 1250 GMT there were 1/8 cumulus at 750 meters (2500 feet), 7/8 altocumulus at 2400 meters (8000 feet) with visibility improving to 9 kilometers in light fog at 1250 GMT.

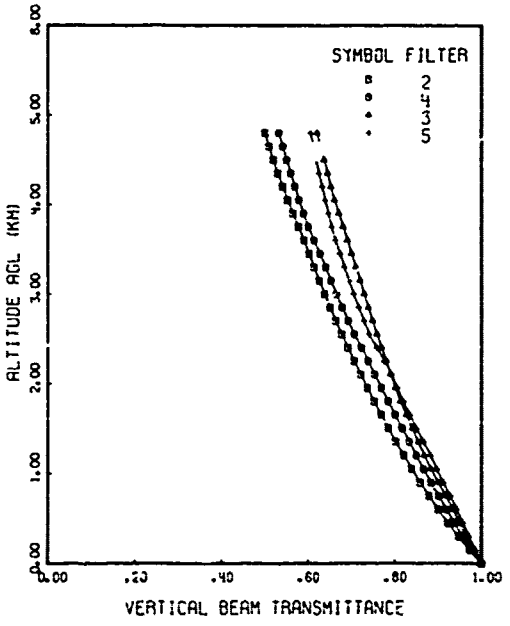
The radiosonde station was northeast near Rome 473 kilometers from the track. This sounding showed mostly westerly winds indicating that it was in an airflow paralliel to the track Winds aloft data were available from Trapani.

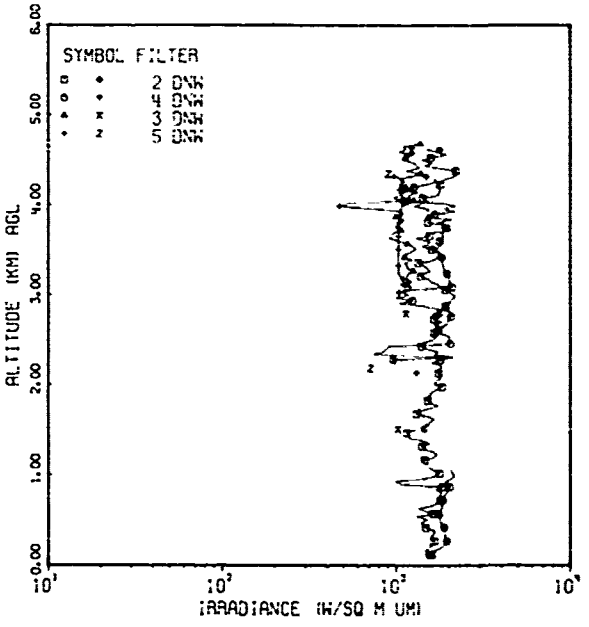
Synoptic Remarks. The 0000 GMT surface chart showed a very weak gradient over Sicily and the entire area of western Europe. A 1005 millibar low in the southern portion of the North Sea was filling slowly. A 1023 millibar high over Russia was centered at 53°N 31°E. The frontal system that was 5° west of the Irish coast was weakening. At 1200 GMT a very weak gradient covered western Europe There was a weak high oriented northnortheast to southsouthwest from western Russia through Sicily to Libya Sicily and the track had a light and variable surface flow of wind. The 500 millibar chart for 0000 GMT showed a closed high centered in the Mediterranean and encompassing Sicily. Winds were light and variable over the track. At 1200 GMT the closed high continued over the central Mediterranean. Wind flow over the track was light to moderate westerly. The air mass was maritime polar. The satellite maps for 1259 and 1309 GMT showed thin clouds over the track and over most of Europe except for Spain and Portugal The computer printed maps showed broken altocumulus at 10000 feet and high cirrus over western Sicily.

FLIGHT NO. C-461
TRAPANI









FLIGHT NO. C-461
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4176 DATE 05/27/80)
DATE 80378 FLIGHT NO. C-461 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.90E-04)	(1.55E-04)	(1.20E-04)	(1.00E-04)
30	(1.89E-04)	(1.54E-04)	(1.20E-04)	(9.98E-05)
60	(1.89E-04)	(1.54E-04)	(1.19E-04)	(9.96E-05)
90	(1.88E-04)	(1.53E-04)	1.19E-04	(9.93E-05)
120	1.88E-04	1.53E-04	1.19E-04	9.91E-05
150	1.87E-04	1.48E-04	1.20E-04	9.91E-05
180	1.82E-04	1.46E-04	1.18E-04	1.01E-04
210	1.81E-04	1.46E-04	1.11E-04	9.63E-05
240	1.71E-04	1.46E-04	1.09E-04	9.51E-05
270	1.70E-04	1.42E-04	1.12E-04	9.61E-05
300	1.70E-04	1.38E-04	1.13E-04	9.74E-05
330	1.71E-04	1.37E-04	1.12E-04	9.69E-05
360	1.74E-04	1.38E-04	1.12E-04	9.73E-05
390	1.76E-04	1.38E-04	1.15E-04	1.02E-04
420	1.70E-04	1.35E-04	1.14E-04	1.02E-04
450	1.67E-04	1.33E-04	1.16E-04	1.03E-04
480	1.61E-04	1.30E-04	1.15E-04	1.00E-04
510	1.64E-04	1.32E-04	1.13E-04	1.01E-04
540	1.59E-04	1.30E-04	1.13E-04	1.01E-04
570	1.58E-04	1.33E-04	1.14E-04	1.02E-04
600	1.55E-04	1.30E-04	1.15E-04	1.04E-04
630	1.58E-04	1.27E-04	1.15E-04	1.04E-04
660	1.61E-04	1.27E-04	1.15E-04	1.05E-04
690	1.64E-04	1.27E-04	1.15E-04	1.12E-04
720	1.60E-04	1.30E-04	1.17E-04	1.21E-04
750	1.54E-04	1.37E-04	1.20E-04	1.17E-04
780	1.60E-04	1.38E-04	1.19E-04	1.19E-04
810	1.59E-04	1.35E-04	1.23E-04	1.17E-04
840	1.59E-04	1.28E-04	1.34E-04	1.09E-04
870	1.59E-04	1.27E-04	1.31E-04	1.08E-04
900	1.59E-04	1.27E-04	1.25E-04	1.07E-04
930	1.56E-04	1.27E-04	1.21E-04	1.09E-04
960	1.53E-04	1.28E-04	1.22E-04	1.09E-04
990	1.49E-04	1.29E-04	1.22E-04	1.06E-04
1020	1.50E-04	1.29E-04	1.22E-04	1.03E-04
1050	1.48E-04	1.29E-04	1.22E-04	1.03E-04
1080	1.43E-04	1.29E-04	1.22E-04	1.03E-04
1110	1.41E-04	1.29E-04	1.20E-04	1.05E-04
1140	1.47E-04	1.30E-04	1.18E-04	1.09E-04
1170	1.48E-04	1.30E-04	1.15E-04	1.11E-04
1200	1.47E-04	1.30E-04	1.10E-04	1.13E-04
1230	1.49E-04	1.30E-04	1.09E-04	1.14E-04
1260	1.49E-04	1.30E-04	1.07E-04	1.22E-04
1290	1.47E-04	1.30E-04	1.06E-04	1.23E-04
1320	1.48E-04	1.30E-04	1.05E-04	1.28E-04
1350	1.48E-04	1.31E-04	1.05E-04	1.31E-04
1380	1.45E-04	1.31E-04	1.06E-04	1.31E-04
1410	1.45E-04	1.31E-04	1.08E-04	1.31E-04
1440	1.45E-04	1.31E-04	1.06E-04	1.31E-04
1470	1.43E-04	1.31E-04	1.06E-04	1.30E-04
1500	1.43E-04	1.31E-04	1.11E-04	1.24E-04

FLIGHT NO. C-461
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4176 DATE 05/27/80)
DATE 80378 FLIGHT NO. C-461 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.43E-04	1.32E-04	1.12E-04	1.16E-04
1560	1.43E-04	1.32E-04	1.11E-04	1.18E-04
1590	1.43E-04	1.32E-04	1.11E-04	1.16E-04
1620	1.41E-04	1.32E-04	1.12E-04	1.23E-04
1650	1.39E-04	1.32E-04	1.10E-04	1.22E-04
1680	1.38E-04	1.32E-04	1.08E-04	1.22E-04
1710	1.39E-04	1.32E-04	1.07E-04	1.21E-04
1740	1.41E-04	1.33E-04	1.05E-04	1.20E-04
1770	1.42E-04	1.33E-04	1.02E-04	1.17E-04
1800	1.41E-04	1.33E-04	9.81E-05	1.14E-04
1830	1.41E-04	1.33E-04	9.53E-05	1.13E-04
1860	1.40E-04	1.33E-04	9.45E-05	1.12E-04
1890	1.46E-04	1.33E-04	9.30E-05	1.12E-04
1920	1.44E-04	1.34E-04	9.33E-05	1.13E-04
1950	1.47E-04	1.34E-04	9.35E-05	1.13E-04
1980	1.44E-04	1.34E-04	9.45E-05	1.10E-04
2010	1.42E-04	1.34E-04	9.55E-05	1.06E-04
2040	1.41E-04	1.34E-04	9.49E-05	1.08E-04
2070	1.41E-04	1.34E-04	9.32E-05	1.09E-04
2100	1.39E-04	1.35E-04	9.31E-05	1.10E-04
2130	1.39E-04	1.35E-04	9.06E-05	1.21E-04
2160	1.38E-04	1.35E-04	9.03E-05	1.31E-04
2190	1.39E-04	1.35E-04	8.95E-05	1.41E-04
2220	1.37E-04	1.35E-04	8.93E-05	1.43E-04
2250	1.38E-04	1.35E-04	9.01E-05	1.47E-04
2280	1.38E-04	1.35E-04	8.91E-05	1.47E-04
2310	1.39E-04	1.33E-04	9.00E-05	1.47E-04
2340	1.37E-04	1.40E-04	9.03E-05	1.52E-04
2370	1.36E-04	1.71E-04	9.10E-05	1.60E-04
2400	1.36E-04	1.69E-04	9.11E-05	1.69E-04
2430	1.36E-04	1.65E-04	9.02E-05	1.70E-04
2460	1.35E-04	1.52E-04	8.99E-05	1.72E-04
2490	1.34E-04	1.47E-04	9.04E-05	1.66E-04
2520	1.34E-04	1.39E-04	9.05E-05	1.43E-04
2550	1.34E-04	1.38E-04	9.03E-05	1.16E-04
2580	1.34E-04	1.46E-04	8.91E-05	1.15E-04
2610	1.34E-04	1.43E-04	9.01E-05	1.11E-04
2640	1.34E-04	1.31E-04	9.02E-05	1.10E-04
2670	1.33E-04	1.30E-04	8.93E-05	1.12E-04
2700	1.33E-04	1.30E-04	9.01E-05	1.08E-04
2730	1.32E-04	1.29E-04	9.05E-05	1.13E-04
2760	1.32E-04	1.28E-04	9.13E-05	1.11E-04
2790	1.35E-04	1.29E-04	9.14E-05	1.13E-04
2820	1.31E-04	1.31E-04	9.13E-05	1.12E-04
2850	1.31E-04	1.32E-04	9.09E-05	1.15E-04
2880	1.31E-04	1.33E-04	9.03E-05	1.14E-04
2910	1.31E-04	1.29E-04	9.02E-05	1.13E-04
2940	1.31E-04	1.28E-04	8.92E-05	1.11E-04
2970	1.31E-04	1.20E-04	8.91E-05	1.12E-04
3000	1.31E-04	1.26E-04	8.68E-05	1.05E-04

FLIGHT NO. C-461
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4176 DATE 05/27/80)
DATE 80378 FLIGHT NO. C-461 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	1.31E-04	1.26E-04	8.67E-05	1.02E-04
3060	1.32E-04	1.27E-04	8.59E-05	1.04E-04
3090	1.32E-04	1.25E-04	8.60E-05	1.03E-04
3120	1.33E-04	1.25E-04	8.47E-05	1.02E-04
3150	1.32E-04	1.25E-04	8.67E-05	1.00E-04
3180	1.33E-04	1.25E-04	8.73E-05	9.94E-05
3210	1.33E-04	1.26E-04	8.82E-05	9.53E-05
3240	1.32E-04	1.26E-04	9.05E-05	9.29E-05
3270	1.32E-04	1.26E-04	9.16E-05	9.53E-05
3300	1.31E-04	1.26E-04	9.29E-05	9.60E-05
3330	1.31E-04	1.24E-04	9.30E-05	9.11E-05
3360	1.30E-04	1.34E-04	9.28E-05	9.15E-05
3390	1.28E-04	1.45E-04	9.30E-05	1.00E-04
3420	1.29E-04	1.48E-04	9.38E-05	1.03E-04
3450	1.31E-04	1.47E-04	9.39E-05	1.02E-04
3480	1.31E-04	1.49E-04	9.34E-05	9.96E-05
3510	1.31E-04	1.52E-04	9.22E-05	1.01E-04
3540	1.30E-04	1.52E-04	9.09E-05	1.07E-04
3570	1.31E-04	1.53E-04	9.04E-05	9.81E-05
3600	1.34E-04	1.50E-04	9.08E-05	9.54E-05
3630	1.43E-04	1.51E-04	9.15E-05	9.03E-05
3660	1.47E-04	1.49E-04	9.20E-05	8.77E-05
3690	1.47E-04	1.48E-04	9.09E-05	8.77E-05
3720	1.49E-04	1.46E-04	9.10E-05	8.82E-05
3750	1.50E-04	1.29E-04	9.03E-05	8.59E-05
3780	1.49E-04	1.29E-04	9.05E-05	8.02E-05
3810	1.49E-04	1.26E-04	9.03E-05	7.77E-05
3840	1.48E-04	1.24E-04	9.24E-05	7.45E-05
3870	1.47E-04	1.22E-04	1.03E-04	7.80E-05
3900	1.45E-04	1.21E-04	1.01E-04	7.80E-05
3930	1.44E-04	1.21E-04	1.02E-04	7.75E-05
3960	1.43E-04	1.20E-04	1.02E-04	7.77E-05
3990	1.41E-04	1.18E-04	1.02E-04	7.78E-05
4020	1.39E-04	1.15E-04	1.02E-04	7.57E-05
4050	1.36E-04	1.13E-04	1.03E-04	7.75E-05
4080	1.38E-04	1.13E-04	9.53E-05	7.32E-05
4110	1.40E-04	1.13E-04	9.16E-05	7.33E-05
4140	1.41E-04	1.12E-04	8.23E-05	7.35E-05
4170	1.40E-04	1.12E-04	7.50E-05	7.54E-05
4200	1.41E-04	1.12E-04	7.31E-05	7.55E-05
4230	1.40E-04	1.12E-04	7.31E-05	7.40E-05
4260	1.38E-04	1.13E-04	7.27E-05	7.75E-05
4290	1.40E-04	1.12E-04	7.15E-05	7.81E-05
4320	1.38E-04	(1.12E-04)	7.45E-05	7.32E-05
4350	1.37E-04	(1.11E-04)	7.93E-05	(7.30E-05)
4380	1.36E-04	(1.11E-04)	8.08E-05	(7.28E-05)
4410	1.36E-04	(1.11E-04)	8.12E-05	(7.26E-05)
4440	1.36E-04	(1.10E-04)	8.29E-05	(7.23E-05)
4470	1.35E-04	(1.10E-04)	8.47E-05	(7.21E-05)
4500	1.31E-04	(1.10E-04)	9.05E-05	(7.19E-05)

FLIGHT NO. C-461
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4176 DATE 05/27/80)
DATE 80378 FLIGHT NO. C-461 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	1.31E-04	(1.09E-04)	9.51E-05	(7.17E-05)
4560	1.31E-04	(1.09E-04)	9.20E-05	(7.14E-05)
4590	1.29E-04	(1.09E-04)	8.70E-05	(7.12E-05)
4620	1.28E-04	(1.08E-04)	8.67E-05	(7.10E-05)
4650	(1.27E-04)	(1.08E-04)	8.44E-05	(7.08E-05)
4680	(1.27E-04)	(1.08E-04)	8.21E-05	(7.06E-05)
4710	(1.26E-04)	(1.07E-04)	(8.19E-05)	(7.03E-05)
4740	(1.26E-04)	(1.07E-04)	(8.16E-05)	(7.01E-05)
4770	(1.26E-04)	(1.07E-04)	(8.14E-05)	(6.99E-05)
4800	(1.25E-04)	(1.06E-04)	(8.11E-05)	(6.97E-05)
FIRST DATA ALT	120	120	90	120
LAST DATA ALT	4620	4290	4680	4320

FLIGHT NO. C-461
EQUIVALENT ATTENUATION LENGTH

(JOB 4176 DATE 05/27/80)
DATE 80378 FLIGHT NO. C-461 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	5.26E 03	6.46E 03	8.32E 03	9.97E 03
300	5.48E 03	6.72E 03	8.59E 03	1.02E 04
600	5.74E 03	7.08E 03	8.69E 03	1.01E 04
900	5.90E 03	7.26E 03	8.54E 03	9.65E 03
1200	6.09E 03	7.38E 03	8.49E 03	9.58E 03
1500	6.22E 03	7.44E 03	8.65E 03	9.20E 03
1800	6.35E 03	7.46E 03	8.74E 03	9.05E 03
2100	6.44E 03	7.46E 03	8.97E 03	9.05E 03
2400	6.53E 03	7.42E 03	9.19E 03	8.73E 03
2700	6.62E 03	7.36E 03	9.36E 03	8.56E 03
3000	6.71E 03	7.39E 03	9.51E 03	8.59E 03
3300	6.78E 03	7.44E 03	9.66E 03	8.71E 03
3600	6.85E 03	7.40E 03	9.74E 03	8.81E 03
3900	6.84E 03	7.39E 03	9.82E 03	8.99E 03
4200	6.86E 03	7.47E 03	9.87E 03	9.20E 03
4500	6.89E 03	7.56E 03	1.00E 04	9.40E 03
4800	6.94E 03	7.64E 03	1.01E 04	9.60E 03

FLIGHT NO. C-461
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.47E-01	9.56E-01	9.55E-01	9.71E-01
600	9.01E-01	9.19E-01	9.33E-01	9.42E-01
900	8.59E-01	8.83E-01	9.00E-01	9.11E-01
1200	8.21E-01	8.50E-01	8.68E-01	8.82E-01
1500	7.86E-01	8.17E-01	8.41E-01	8.50E-01
1800	7.53E-01	7.86E-01	8.14E-01	8.20E-01
2100	7.22E-01	7.55E-01	7.91E-01	7.93E-01
2400	6.93E-01	7.24E-01	7.70E-01	7.60E-01
2700	6.65E-01	6.93E-01	7.50E-01	7.29E-01
3000	6.39E-01	6.66E-01	7.30E-01	7.05E-01
3300	6.15E-01	6.42E-01	7.11E-01	6.85E-01
3600	5.91E-01	6.15E-01	6.91E-01	6.65E-01
3900	5.66E-01	5.90E-01	6.72E-01	6.48E-01
4200	5.42E-01	5.70E-01	6.53E-01	6.34E-01
4500	5.20E-01	5.51E-01	6.38E-01	6.20E-01
4800	5.01E-01	5.34E-01	6.22E-01	6.07E-01

FLIGHT C-462 - 5 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0851	1043	1.82	37.8	-	21.6	90	6120
4,5	1049	1240	1.85	21 4	20 6	27.8	90	6120

Flight Description. Flight C-462 was a midday flight spanning local apparent noon. Take off was at 0750 and landing at 1326 GMT. Skies were clear with several haze layers. The approximate northwest to southeast Trapani track was located west of Sicily. Typical terrain features along the nearby coast were brown and green rolling fields. Directly below the track were the relatively shallow waters of the Strait of Sicily.

In-Flight Notes. The in-flight observer noted as the initial summary that a high level moisture region moved through the area yesterday. The climbout from Sigonella revealed several distinct and significant layers in haze. Moderate haze was relatively uniform below 2100 kilometers (7000 feet) (approximately) with a clear layer between 2100 and 2700 meters (7000 and 9000 feet). Light haze, brown in color, was encountered from 2700 to 3900 meters (9000 to 13,000 feet) with a clear layer 3900 to 4200 meters (13,000 to 14,000 feet) light haze layers above to about 5100 meters (17,000 feet). It appeared mostly clear above but still could be a very light haze. At 0835 GMT on the let down to the track there was light haze at 6000 meters (20,000 feet) with a white horizon; top of the haze was 4200 meters (14,000 feet) with a clear layer between 2400 and 2700 meters (8000 and 9000 feet). The maritime inversion was about 2000 feet. At 0851 GMT at 300 meters (1000 feet) it was clear with a slant range of 32 kilometers (20 miles) and moderate haze. At 0913 GMT it was clear, slant range of 35.2 kilometers (22 miles) with moderate haze. At 0930 GMT on the climb from 1800 to 3600 meters (6000 to 12,000 feet) there was a partially clear layer from 2100 to 2400 meters (7000 to 8000 feet) that was becoming much less distinct than previously but there was no other structure. At 3600 meters (12,000 feet) it was clear with slant range 36.8 kilometers (23 miles). At 6000 meters (20,000 feet) it was still clear with slant range 51.2 kilometers (32 miles) and a white horizon. At 1000 GMT on the climb to 6000 meters (20,000 feet) the main haze top was 4650 meters (15,500 feet) with very light haze above. On the descent at 1035 GMT the clear layer between 2100 and 2700 meters (7000 and 9000 feet) was gone. For the remainder of the flight slant ranges were 35.2 to 40 kilometers (22 to 25 miles) and the horizon continued to be white.

Local Weather Notes. Trapani, 40 8 kilometers northeast of the flight track, reported clear skies. There were no reports of visibility.

Pantelleria, an island 93 5 kilometers southwest of the track center, recorded 2/8 to 1/8 altocumulus at 3000 meters (10,000 feet) until 0900 GMT and clear skies thereafter. Visibility was 8 to 9 kilometers in light fog

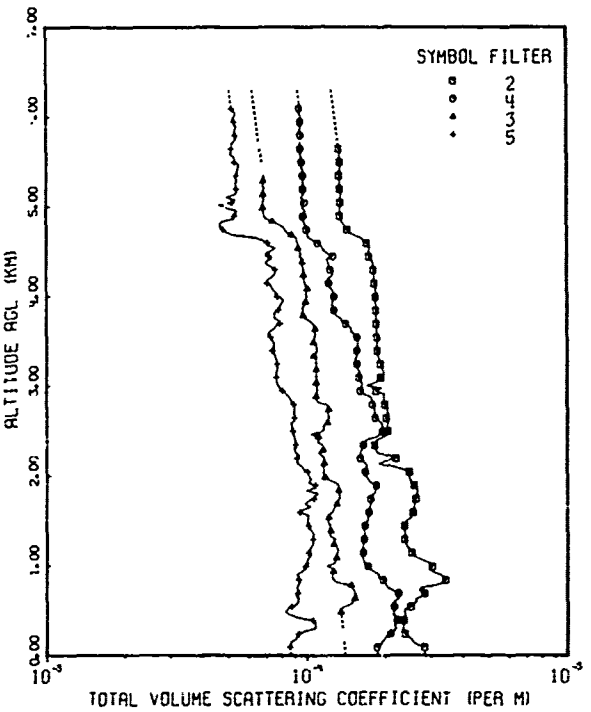
Palermo, 88 8 kilometers east of the track, reported clear skies throughout the period Visibility of 6 kilometers in light fog gradually improved to 11 kilometers by 1200 GMT.

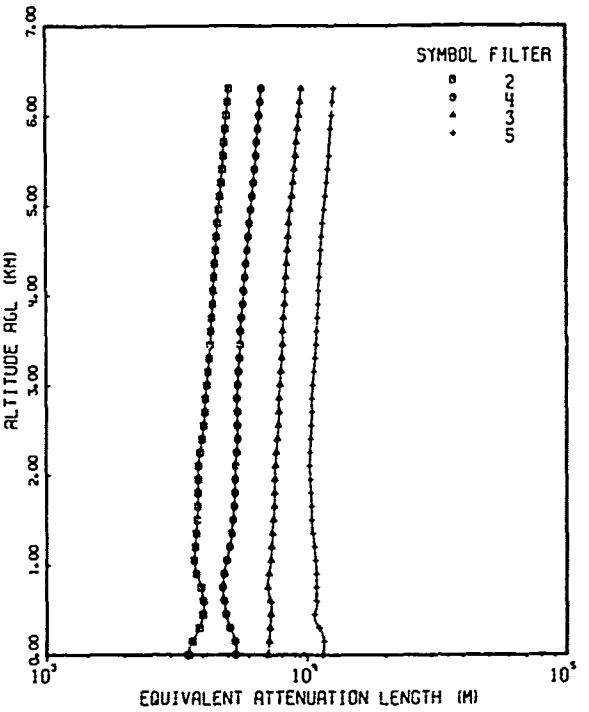
The radiosonde station was northeast of the track near Rome 473 kilometers distant. This sounding showed warm and dry at all levels with strong westerly winds and probably a jet over the area. The sounding was in an airflow parallel to the track.

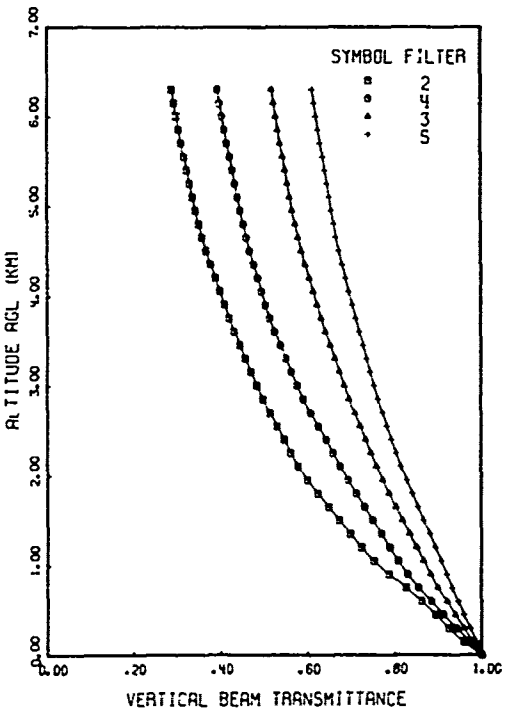
Synoptic Remarks. The surface chart for 0000 GMT showed ground fog over Sicily with a very light pressure gradient. A weak cold front extended from Lithuania southwest to Poland, to central Spain and into the eastern Atlantic. By 1200 GMT the cold front had started to weaken and extended from central Poland southwest through the tip of Portugal with a wave in northeastern Spain. There was a weak gradient over Sicily with the surface flow light northerly. The air mass was maritime polar. At 500 millibars at 0000 GMT there was high pressure over northern Africa with a center in western Algeria. Flow over Sicily and the track was moderate northwesterly. By 1200 GMT the high was centered near 30°N 8°E and there was moderate westnorthwesterly flow over the track. The satellite map for 1309 GMT showed clear skies over Sicily as did the computer printouts. The air mass was modified maritime polar.

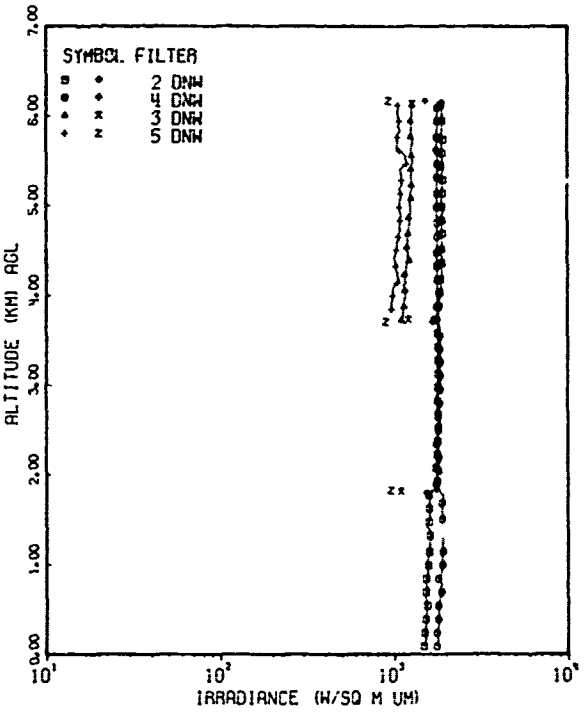
FLIGHT NO. C-462

TRAPANI









FLIGHT NO. C-462
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.85E-04)	(1.87E-04)	(1.41E-04)	(8.69E-05)
30	(2.83E-04)	(1.86E-04)	(1.40E-04)	(8.64E-05)
60	(2.82E-04)	(1.86E-04)	(1.40E-04)	(8.62E-05)
90	2.82E-04	1.86E-04	(1.39E-04)	8.60E-05
120	2.62E-04	1.93E-04	(1.39E-04)	8.62E-05
150	2.54E-04	1.94E-04	(1.39E-04)	8.69E-05
180	2.51E-04	1.99E-04	(1.38E-04)	9.08E-05
210	2.43E-04	2.02E-04	(1.38E-04)	9.13E-05
240	2.37E-04	2.09E-04	(1.37E-04)	9.29E-05
270	2.37E-04	2.17E-04	(1.37E-04)	9.86E-05
300	2.33E-04	2.20E-04	(1.37E-04)	1.07E-04
330	2.34E-04	2.17E-04	(1.36E-04)	1.07E-04
360	2.35E-04	2.19E-04	(1.36E-04)	1.07E-04
390	2.34E-04	2.22E-04	(1.35E-04)	1.05E-04
420	2.37E-04	2.22E-04	(1.35E-04)	9.16E-05
450	2.38E-04	2.14E-04	(1.35E-04)	8.60E-05
480	2.37E-04	2.15E-04	1.35E-04	8.21E-05
510	2.37E-04	2.15E-04	1.34E-04	8.39E-05
540	2.49E-04	2.16E-04	1.39E-04	8.70E-05
570	2.54E-04	2.15E-04	1.48E-04	9.11E-05
600	2.64E-04	2.18E-04	1.50E-04	9.24E-05
630	2.63E-04	2.25E-04	1.53E-04	9.29E-05
660	2.82E-04	2.26E-04	1.56E-04	9.06E-05
690	2.83E-04	2.25E-04	1.53E-04	9.24E-05
720	2.70E-04	2.14E-04	1.52E-04	9.28E-05
750	2.73E-04	2.05E-04	1.49E-04	9.13E-05
780	3.07E-04	2.02E-04	1.43E-04	9.23E-05
810	3.37E-04	1.99E-04	1.30E-04	9.39E-05
840	3.41E-04	1.96E-04	1.25E-04	9.28E-05
870	3.36E-04	1.88E-04	1.25E-04	9.23E-05
900	3.26E-04	1.89E-04	1.25E-04	9.16E-05
930	3.05E-04	1.81E-04	1.26E-04	9.61E-05
960	2.93E-04	1.73E-04	1.26E-04	9.75E-05
990	3.02E-04	1.71E-04	1.19E-04	9.88E-05
1020	3.03E-04	1.67E-04	1.28E-04	1.01E-04
1050	2.83E-04	1.65E-04	1.28E-04	1.00E-04
1080	2.66E-04	1.63E-04	1.29E-04	1.01E-04
1110	2.54E-04	1.63E-04	1.30E-04	1.03E-04
1140	2.52E-04	1.64E-04	1.31E-04	1.01E-04
1170	2.51E-04	1.64E-04	1.31E-04	1.02E-04
1200	2.43E-04	1.63E-04	1.30E-04	1.03E-04
1230	2.40E-04	1.64E-04	1.26E-04	1.05E-04
1260	2.37E-04	1.65E-04	1.27E-04	1.05E-04
1290	2.36E-04	1.65E-04	1.28E-04	1.05E-04
1320	2.37E-04	1.66E-04	1.22E-04	1.05E-04
1350	2.37E-04	1.66E-04	1.22E-04	1.05E-04
1380	2.37E-04	1.66E-04	1.23E-04	1.04E-04
1410	2.39E-04	1.67E-04	1.22E-04	1.03E-04
1440	2.37E-04	1.67E-04	1.23E-04	1.02E-04
1470	2.37E-04	1.68E-04	1.21E-04	1.01E-04
1500	2.42E-04	1.72E-04	1.20E-04	1.01E-04

FLIGHT NO. C-462
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	2.51E-04	1.72E-04	1.21E-04	1.01E-04
1560	2.54E-04	1.72E-04	1.22E-04	1.01E-04
1590	2.55E-04	1.73E-04	1.25E-04	9.39E-05
1620	2.56E-04	1.74E-04	1.27E-04	9.67E-05
1650	2.58E-04	1.74E-04	1.28E-04	1.03E-04
1680	2.59E-04	1.76E-04	1.30E-04	9.84E-05
1710	2.60E-04	1.76E-04	1.32E-04	1.01E-04
1740	2.61E-04	1.76E-04	1.34E-04	1.06E-04
1770	2.63E-04	1.74E-04	1.33E-04	1.07E-04
1800	2.64E-04	1.82E-04	1.33E-04	1.10E-04
1830	2.65E-04	1.83E-04	1.32E-04	9.93E-05
1860	2.63E-04	1.84E-04	1.33E-04	1.06E-04
1890	2.57E-04	1.85E-04	1.32E-04	1.07E-04
1920	2.51E-04	1.76E-04	1.28E-04	1.01E-04
1950	2.48E-04	1.72E-04	1.20E-04	1.03E-04
1980	2.46E-04	1.69E-04	1.17E-04	1.02E-04
2010	2.47E-04	1.65E-04	1.16E-04	1.01E-04
2040	2.47E-04	1.68E-04	1.16E-04	1.00E-04
2070	2.33E-04	1.69E-04	1.16E-04	9.71E-05
2100	2.14E-04	1.71E-04	1.16E-04	9.59E-05
2130	1.89E-04	1.68E-04	1.17E-04	9.20E-05
2160	1.99E-04	1.64E-04	1.16E-04	9.23E-05
2190	2.20E-04	1.61E-04	1.17E-04	9.16E-05
2220	2.07E-04	1.61E-04	1.15E-04	9.39E-05
2250	1.87E-04	1.60E-04	1.11E-04	9.05E-05
2280	1.85E-04	1.63E-04	1.15E-04	8.95E-05
2310	1.81E-04	1.64E-04	1.16E-04	8.98E-05
2340	1.82E-04	1.65E-04	1.15E-04	9.07E-05
2370	1.85E-04	1.68E-04	1.10E-04	9.02E-05
2400	1.87E-04	1.71E-04	1.11E-04	8.97E-05
2430	1.97E-04	1.86E-04	1.10E-04	8.92E-05
2460	2.04E-04	1.92E-04	1.03E-04	8.87E-05
2490	2.05E-04	1.95E-04	1.14E-04	8.82E-05
2520	2.04E-04	1.95E-04	1.16E-04	8.77E-05
2550	2.03E-04	1.95E-04	1.16E-04	8.72E-05
2580	2.05E-04	1.94E-04	1.20E-04	8.67E-05
2610	2.04E-04	1.89E-04	1.20E-04	8.94E-05
2640	2.01E-04	1.83E-04	1.21E-04	8.95E-05
2670	2.05E-04	1.81E-04	1.20E-04	8.95E-05
2700	2.04E-04	1.82E-04	1.20E-04	8.88E-05
2730	2.04E-04	1.81E-04	1.21E-04	8.93E-05
2760	2.02E-04	1.81E-04	1.22E-04	8.91E-05
2790	2.00E-04	1.79E-04	1.19E-04	8.92E-05
2820	1.98E-04	1.80E-04	1.10E-04	8.74E-05
2850	1.99E-04	1.77E-04	1.09E-04	8.64E-05
2880	1.97E-04	1.76E-04	1.09E-04	8.50E-05
2910	1.98E-04	1.63E-04	1.09E-04	8.28E-05
2940	1.84E-04	1.61E-04	1.09E-04	8.05E-05
2970	1.94E-04	1.63E-04	1.09E-04	7.90E-05
3000	1.70E-04	1.63E-04	1.09E-04	7.75E-05

FLIGHT NO. C-462
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	1.82E-04	1.63E-04	1.09E-04	7.66E-05
3060	1.92E-04	1.60E-04	1.09E-04	7.62E-05
3090	1.93E-04	1.58E-04	1.09E-04	7.62E-05
3120	1.98E-04	1.58E-04	1.08E-04	7.64E-05
3150	1.99E-04	1.60E-04	1.08E-04	7.62E-05
3180	1.95E-04	1.57E-04	1.08E-04	7.70E-05
3210	1.94E-04	1.55E-04	1.08E-04	7.70E-05
3240	1.92E-04	1.56E-04	1.08E-04	7.57E-05
3270	1.91E-04	1.53E-04	1.09E-04	7.64E-05
3300	1.89E-04	1.54E-04	1.08E-04	7.58E-05
3330	1.87E-04	1.56E-04	1.05E-04	7.53E-05
3360	1.87E-04	1.56E-04	1.03E-04	7.49E-05
3390	1.86E-04	1.56E-04	1.09E-04	7.35E-05
3420	1.86E-04	1.56E-04	1.09E-04	7.48E-05
3450	1.86E-04	1.55E-04	1.08E-04	7.46E-05
3480	1.86E-04	1.56E-04	1.05E-04	7.44E-05
3510	1.86E-04	1.56E-04	1.06E-04	7.32E-05
3540	1.86E-04	1.56E-04	1.07E-04	7.25E-05
3570	1.85E-04	1.55E-04	1.08E-04	7.11E-05
3600	1.86E-04	1.48E-04	1.07E-04	7.20E-05
3630	1.86E-04	1.48E-04	1.08E-04	7.48E-05
3660	1.86E-04	1.45E-04	1.07E-04	7.64E-05
3690	1.85E-04	1.41E-04	1.06E-04	7.90E-05
3720	1.85E-04	1.36E-04	1.03E-04	7.82E-05
3750	1.85E-04	1.36E-04	9.86E-05	7.52E-05
3780	1.85E-04	1.30E-04	9.70E-05	7.51E-05
3810	1.84E-04	1.27E-04	9.55E-05	7.48E-05
3840	1.84E-04	1.27E-04	9.69E-05	7.77E-05
3870	1.84E-04	1.26E-04	9.63E-05	7.91E-05
3900	1.84E-04	1.25E-04	9.86E-05	7.93E-05
3930	1.83E-04	1.26E-04	9.91E-05	8.09E-05
3960	1.82E-04	1.27E-04	9.95E-05	8.11E-05
3990	1.83E-04	1.27E-04	9.96E-05	7.70E-05
4020	1.85E-04	1.26E-04	9.93E-05	7.58E-05
4050	1.84E-04	1.27E-04	9.94E-05	7.56E-05
4080	1.85E-04	1.24E-04	1.01E-04	7.36E-05
4110	1.83E-04	1.21E-04	9.95E-05	7.53E-05
4140	1.82E-04	1.22E-04	9.87E-05	7.05E-05
4170	1.82E-04	1.21E-04	9.80E-05	7.07E-05
4200	1.82E-04	1.22E-04	9.78E-05	7.29E-05
4230	1.81E-04	1.26E-04	9.76E-05	7.52E-05
4260	1.81E-04	1.26E-04	9.82E-05	7.61E-05
4290	1.81E-04	1.23E-04	9.72E-05	7.57E-05
4320	1.80E-04	1.22E-04	9.69E-05	7.38E-05
4350	1.80E-04	1.21E-04	9.60E-05	7.03E-05
4380	1.80E-04	1.20E-04	9.65E-05	6.99E-05
4410	1.74E-04	1.19E-04	9.55E-05	7.34E-05
4440	1.74E-04	1.26E-04	9.42E-05	7.15E-05
4470	1.74E-04	1.20E-04	9.49E-05	6.97E-05
4500	1.73E-04	1.17E-04	9.40E-05	7.27E-05

FLIGHT NO. C-462
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 3

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	1.74E-04	1.15E-04	9.28E-05	7.59E-05
4560	1.74E-04	1.14E-04	9.29E-05	7.15E-05
4590	1.70E-04	1.10E-04	9.20E-05	7.07E-05
4620	1.66E-04	1.06E-04	9.12E-05	5.79E-05
4650	1.61E-04	1.02E-04	9.11E-05	6.46E-05
4680	1.52E-04	1.01E-04	8.74E-05	5.25E-05
4710	1.44E-04	1.00E-04	8.33E-05	4.91E-05
4740	1.43E-04	9.98E-05	8.21E-05	4.77E-05
4770	1.40E-04	9.95E-05	8.08E-05	4.63E-05
4800	1.39E-04	9.88E-05	7.77E-05	4.66E-05
4830	1.36E-04	9.76E-05	7.41E-05	4.80E-05
4860	1.35E-04	9.60E-05	7.00E-05	5.27E-05
4890	1.35E-04	9.73E-05	6.89E-05	5.30E-05
4920	1.34E-04	9.82E-05	6.85E-05	5.40E-05
4950	1.35E-04	9.90E-05	6.83E-05	5.42E-05
4980	1.35E-04	9.66E-05	6.81E-05	4.97E-05
5010	1.35E-04	9.65E-05	6.81E-05	4.61E-05
5040	1.35E-04	9.83E-05	6.82E-05	5.19E-05
5070	1.35E-04	9.65E-05	6.87E-05	5.35E-05
5100	1.35E-04	9.55E-05	6.82E-05	4.89E-05
5130	1.36E-04	9.78E-05	6.83E-05	5.37E-05
5160	1.35E-04	9.66E-05	6.85E-05	5.43E-05
5190	1.34E-04	9.70E-05	6.86E-05	5.41E-05
5220	1.35E-04	9.73E-05	6.83E-05	5.37E-05
5250	1.34E-04	9.70E-05	6.82E-05	5.36E-05
5280	1.34E-04	9.73E-05	6.82E-05	5.41E-05
5310	1.34E-04	9.69E-05	6.88E-05	5.34E-05
5340	1.33E-04	9.69E-05	6.85E-05	5.39E-05
5370	1.32E-04	9.67E-05	(6.83E-05)	5.43E-05
5400	1.35E-04	9.70E-05	(5.81E-05)	5.46E-05
5430	1.35E-04	9.55E-05	(6.78E-05)	5.48E-05
5460	1.34E-04	9.57E-05	(5.76E-05)	5.52E-05
5490	1.34E-04	9.57E-05	(6.74E-05)	5.30E-05
5520	1.34E-04	9.50E-05	(5.72E-05)	5.31E-05
5550	1.34E-04	9.54E-05	(5.70E-05)	5.27E-05
5580	1.34E-04	9.45E-05	(5.53E-05)	5.07E-05
5610	1.35E-04	9.52E-05	(6.66E-05)	5.19E-05
5640	1.33E-04	9.50E-05	(5.63E-05)	5.17E-05
5670	(1.33E-04).	9.52E-05	(6.61E-05)	5.22E-05
5700	(1.33E-04)	9.47E-05	(5.59E-05)	5.19E-05
5730	(1.32E-04)	9.47E-05	(6.57E-05)	5.34E-05
5760	(1.32E-04).	9.49E-05	(6.55E-05)	5.42E-05
5790	(1.31E-04)	9.49E-05	(6.53E-05)	5.34E-05
5820	(1.31E-04)	9.48E-05	(5.51E-05)	5.32E-05
5850	(1.30E-04)	9.45E-05	(6.49E-05)	5.34E-05
5880	(1.30E-04).	9.47E-05	(6.47E-05)	5.40E-05
5910	(1.30E-04)	9.45E-05	(6.45E-05)	5.34E-05
5940	(1.29E-04)	9.49E-05	(6.43E-05)	5.29E-05
5970	(1.29E-04)	9.45E-05	(5.41E-05)	5.20E-05
6000	(1.28E-04)	9.51E-05	(6.38E-05)	5.32E-05

FLIGHT NO. C-462
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	(1.28E-04)	9.37E-05	(6.35E-05)	5.36E-05
6060	(1.28E-04)	9.43E-05	(6.34E-05)	5.26E-05
6090	(1.27E-04)	9.37E-05	(6.32E-05)	5.16E-05
6120	(1.27E-04)	9.43E-05	(6.30E-05)	5.14E-05
6150	(1.26E-04)	(9.40E-05)	(6.28E-05)	(5.13E-05)
6180	(1.26E-04)	(9.37E-05)	(6.26E-05)	(5.11E-05)
6210	(1.26E-04)	(9.34E-05)	(6.24E-05)	(5.09E-05)
6240	(1.25E-04)	(9.31E-05)	(6.22E-05)	(5.08E-05)
6270	(1.25E-04)	(9.28E-05)	(6.20E-05)	(5.06E-05)
6300	(1.24E-04)	(9.25E-05)	(6.18E-05)	(5.04E-05)
FIRST DATA ALT	90	90	480	90
LAST DATA ALT	5640	6120	5340	6120

FLIGHT NO. C-462
EQUIVALENT ATTENUATION LENGTH

(JOB 4177 DATE 05/27/80)
DATE 80578 FLIGHT NO. C-462 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	3.51E 03	5.34E 03	7.11E 03	1.15E 04
300	3.86E 03	5.06E 03	7.22E 03	1.11E 04
600	4.01E 03	4.82E 03	7.24E 03	1.09E 04
900	3.76E 03	4.81E 03	7.16E 03	1.08E 04
1200	3.71E 03	5.05E 03	7.32E 03	1.06E 04
1500	3.80E 03	5.22E 03	7.46E 03	1.04E 04
1800	3.82E 03	5.30E 03	7.52E 03	1.03E 04
2100	3.84E 03	5.35E 03	7.60E 03	1.02E 04
2400	3.97E 03	5.43E 03	7.72E 03	1.03E 04
2700	4.06E 03	5.42E 03	7.81E 03	1.04E 04
3000	4.14E 03	5.45E 03	7.91E 03	1.05E 04
3300	4.22E 03	5.52E 03	8.01E 03	1.07E 04
3600	4.30E 03	5.59E 03	8.10E 03	1.09E 04
3900	4.37E 03	5.70E 03	8.22E 03	1.11E 04
4200	4.43E 03	5.82E 03	8.33E 03	1.12E 04
4500	4.49E 03	5.93E 03	8.44E 03	1.13E 04
4800	4.58E 03	6.07E 03	8.58E 03	1.16E 04
5100	4.68E 03	6.22E 03	8.79E 03	1.18E 04
5400	4.78E 03	6.36E 03	8.99E 03	1.21E 04
5700	4.87E 03	6.50E 03	9.13E 03	1.23E 04
6000	4.96E 03	6.62E 03	9.37E 03	1.25E 04
6300	5.05E 03	6.75E 03	9.55E 03	1.28E 04

FLIGHT NO. C-462
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.29E-01	9.42E-01	9.59E-01	9.73E-01
600	8.61E-01	8.83E-01	9.20E-01	9.46E-01
900	7.87E-01	8.29E-01	8.82E-01	9.20E-01
1200	7.24E-01	7.89E-01	8.49E-01	8.93E-01
1500	6.74E-01	7.50E-01	8.18E-01	8.65E-01
1800	6.24E-01	7.12E-01	7.87E-01	8.40E-01
2100	5.79E-01	6.75E-01	7.58E-01	8.15E-01
2400	5.46E-01	6.43E-01	7.33E-01	7.93E-01
2700	5.14E-01	6.08E-01	7.08E-01	7.72E-01
3000	4.85E-01	5.77E-01	6.84E-01	7.52E-01
3300	4.58E-01	5.50E-01	6.62E-01	7.35E-01
3600	4.33E-01	5.25E-01	6.41E-01	7.19E-01
3900	4.09E-01	5.04E-01	6.22E-01	7.03E-01
4200	3.87E-01	4.85E-01	6.04E-01	6.87E-01
4500	3.67E-01	4.68E-01	5.87E-01	6.72E-01
4800	3.50E-01	4.54E-01	5.71E-01	6.59E-01
5100	3.36E-01	4.41E-01	5.60E-01	6.50E-01
5400	3.23E-01	4.28E-01	5.48E-01	6.40E-01
5700	3.10E-01	4.16E-01	5.37E-01	6.30E-01
6000	2.98E-01	4.04E-01	5.27E-01	6.20E-01
6300	2.87E-01	3.93E-01	5.17E-01	6.10E-01

FLIGHT C-463 - 7 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0928	1110	1.70	31.7	-	21.1	90	6090
4,5	1128	1256	1.47	21.1	-	30.7	120	6090

Flight Description. Flight C-463 was a midday flight spanning local apparent noon. The take off was at 0834 GMT and the landing at 1341 GMT. The flight began with clear skies but scattered to broken clouds moved in rapidly from the west after 1120 GMT. The track was slipped to the east to remain ahead of the approaching cloud decks and the second half of the flight was conducted south of Agrigento. The approximate northwest to southeast Trapani track was located west of Sicily. Typical terrain features along the nearby coast were brown and green rolling fields. Directly below the track were the relatively shallow waters of the Strait of Sicily.

In-Flight Notes. The in-flight observer noted on the outbound climbout that the haze layer was thick again today although visibility remained relatively good throughout the depth of the haze. The lowest haze layer tops out at 4050 to 4200 meters (13,500 to 14,000 feet) and layered haze is visible above. Distinct layers exist up through 6000 meters (20,000 feet) with thin layers above. Over Trapani some clouds were visible to the west. It appeared that there would be enough time to complete profile prior to significant cloud impact. At 0927 GMT at 300 meters (1000 feet) it was clear with slant range 40 kilometers (25 miles) in moderate haze. At 0954 GMT, altitude 1800 meters (6000 feet) clear with 38.4 kilometers (24 miles) slant range. Climb to 3600 meters (12,000 feet) no layering was visible. On the climb from 3600 to 6000 meters (12,000 to 20,000 feet) there was a cloud layer 5100 to 5700 meters (17,000 to 19,000 feet) moving in from the west, now over Marsala - about halfway down track. At 1120 GMT at 300 meters (1000 feet) there was 4/8 Ac with cloud cover moving in rapidly from the west. On the climb from 3600 to 6000 meters (6000 to 12,000 feet) there was no distinct structure. 1230 GMT run at 6000 meters (20,000 feet) was near top of haze layer but thin layers still exist above. Some layering was visible below before uniform haze depth. This run was south of Agrigento almost parallel to the frontal cloud band with heights between 4800 and 5400 meters (16,000 and 18,000 feet). On the last descent which started at 1244 GMT there were cloud layers at 5550 meters (18,500 feet); thinner layer at 4800 to 5250 meters (16,000 to 17,500 feet) (same as cloud deck to the west); and below 4200 meters (14,000 feet) no structure was discernible. Below 900 meters (3000 feet) layers of darker haze, like smoke were visible.

Local Weather Notes. Trapani, 40.8 kilometers northeast of the flight track, reported clear skies until 1200 GMT with 5/8 altocumulus at 3000 meters (10,000 feet) and 6/8 to 7/8 cirrus at an undefined height. Visibilities were missing.

Pantelleria, an island 93.5 kilometers southwest of the track center, reported clear skies until 1209 GMT with thin altocumulus at 3000 meters (10,000 feet) at that time. Visibilities were missing as was the cloud cover at 1300 GMT.

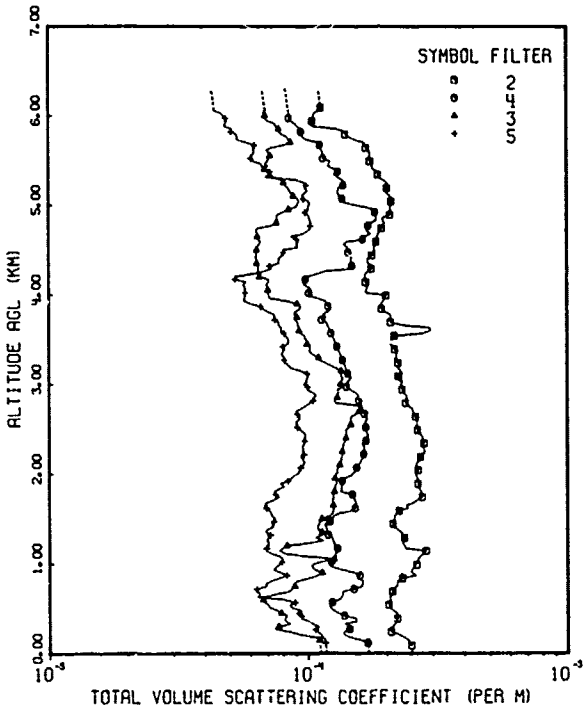
Palermo, 88.8 kilometers east of the track, also reported clear skies during the morning. At 1200 GMT and later there were 4/8 altocumulus at 3000 meters (10,000 feet). Visibility was 15 kilometers at 0900 GMT and 11.2 kilometers at 1020 GMT, observations at other hours were missing.

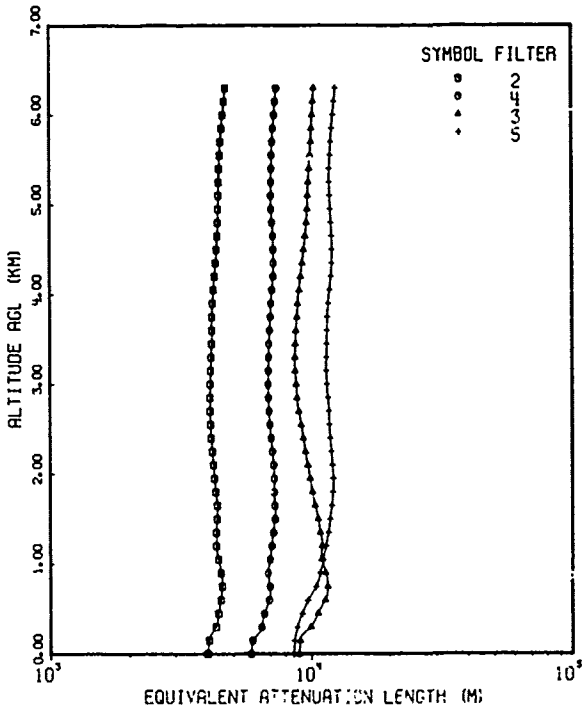
The radiosonde station was northeast of the track near Rome, a distance of 473 kilometers. This sounding showed considerably more moisture at 1200 GMT than at 0000 GMT. The winds backed from westnorthwest to westsouthwest and the velocities increased by 50%. The sounding was in an airflow parallel to the track.

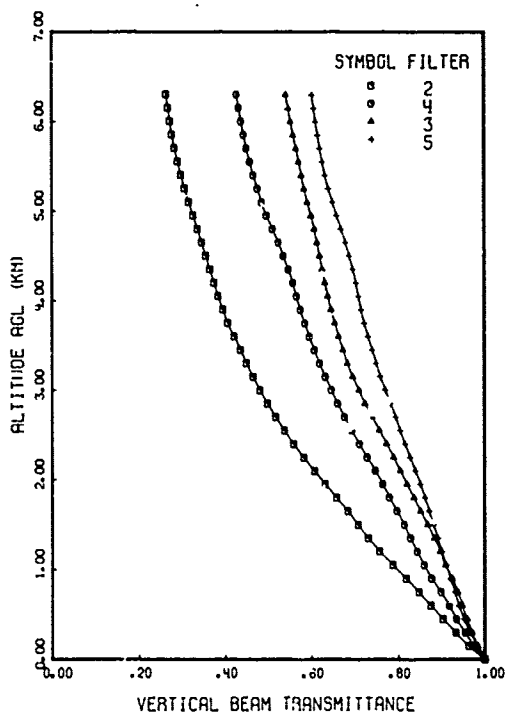
Synoptic Remarks. The 0000 GMT surface chart had a stationary front from Salerno, between Corsica and Sardinia, into the central east coast of Spain then southwestward to Cadiz and into the Atlantic. A weak high pressure cell extended from western Russia southsouthwest to Libya with Sicily in the southwestern quadrant. At 1200 GMT there was a 1000 millibar low centered near Genoa with a warm front east and southeast to the Adriatic Sea. A cold front, part of the same system, extended southwest from Genoa through the western Mediterranean to Morocco. The cold front was 7.5 degrees west of Trapani. Surface flow over Sicily was southerly. The 500 millibar chart for 0000 GMT showed ridging from northwestern Africa that extended northeast through Sicily to Germany. There was troughing from the North Sea southwest to Portugal. At 1200 GMT there was a closed high in Tunisia and ridging northnortheast to Poland. There was troughing from the North Sea to Hispania and moderate northwesterly winds over the track. The air mass was maritime polar. The satellite map for 1309 GMT showed clouds over most of Europe with Sicily in a small clear area. The computer printouts for 0900 GMT showed Sicily in the clear, with scattered altocumulus and cirrus at 1200 GMT.

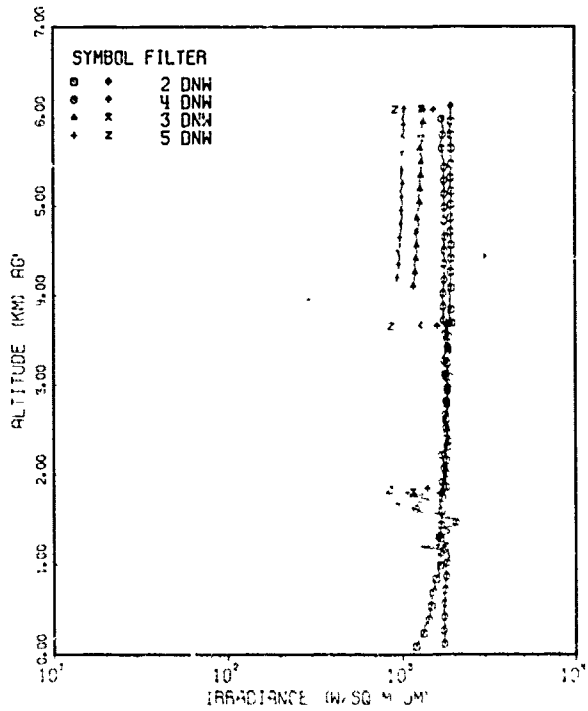
FLIGHT NO. C-463

TRAPANI









FLIGHT NO. C-463
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.51E-04)	(1.71E-04)	(1.12E-04)	(1.17E-04)
30	(2.50E-04)	(1.70E-04)	(1.11E-04)	(1.17E-04)
60	(2.49E-04)	(1.70E-04)	(1.11E-04)	(1.17E-04)
90	2.48E-04	(1.69E-04)	(1.11E-04)	(1.16E-04)
120	2.45E-04	1.69E-04	(1.10E-04)	1.16E-04
150	2.42E-04	1.59E-04	1.10E-04	1.16E-04
180	2.33E-04	1.44E-04	1.07E-04	1.13E-04
210	2.23E-04	1.36E-04	9.41E-05	1.12E-04
240	2.07E-04	1.37E-04	8.49E-05	1.09E-04
270	2.05E-04	1.44E-04	7.41E-05	1.06E-04
300	2.11E-04	1.48E-04	7.68E-05	1.09E-04
330	2.15E-04	1.38E-04	8.52E-05	1.04E-04
360	2.18E-04	1.53E-04	8.13E-05	1.00E-04
390	2.19E-04	1.53E-04	8.10E-05	9.45E-05
420	2.18E-04	1.37E-04	8.27E-05	9.40E-05
450	2.18E-04	1.30E-04	7.86E-05	8.98E-05
480	2.10E-04	1.24E-04	7.54E-05	9.41E-05
510	2.04E-04	1.21E-04	7.07E-05	8.64E-05
540	2.03E-04	1.20E-04	7.03E-05	8.49E-05
570	2.06E-04	1.23E-04	6.77E-05	8.90E-05
600	2.06E-04	1.31E-04	6.69E-05	8.03E-05
630	2.05E-04	1.34E-04	6.79E-05	6.38E-05
660	2.11E-04	1.36E-04	7.48E-05	6.56E-05
690	2.10E-04	1.35E-04	8.45E-05	6.38E-05
720	2.13E-04	1.50E-04	8.66E-05	6.31E-05
750	2.19E-04	1.61E-04	8.88E-05	6.94E-05
780	2.20E-04	1.61E-04	8.87E-05	6.90E-05
810	2.20E-04	1.62E-04	9.11E-05	7.21E-05
840	2.30E-04	1.54E-04	9.99E-05	7.74E-05
870	2.60E-04	1.58E-04	1.08E-04	8.28E-05
900	2.49E-04	1.50E-04	1.13E-04	7.79E-05
930	2.49E-04	1.35E-04	1.06E-04	7.34E-05
960	2.57E-04	1.23E-04	1.03E-04	7.53E-05
990	2.61E-04	1.20E-04	1.03E-04	7.75E-05
1020	2.65E-04	1.22E-04	1.11E-04	7.91E-05
1050	2.65E-04	1.25E-04	1.25E-04	7.98E-05
1080	2.70E-04	1.27E-04	1.00E-04	7.75E-05
1110	2.78E-04	1.27E-04	8.18E-05	7.22E-05
1140	2.84E-04	1.31E-04	7.73E-05	6.92E-05
1170	2.35E-04	1.29E-04	7.97E-05	6.91E-05
1200	2.35E-04	1.26E-04	8.28E-05	7.03E-05
1230	2.29E-04	1.25E-04	9.88E-05	7.05E-05
1260	2.37E-04	1.24E-04	1.14E-04	6.95E-05
1290	2.33E-04	1.23E-04	1.07E-04	7.01E-05
1320	2.29E-04	1.19E-04	1.13E-04	7.15E-05
1350	2.27E-04	1.18E-04	1.13E-04	6.86E-05
1380	2.20E-04	1.17E-04	1.09E-04	6.96E-05
1410	2.11E-04	1.17E-04	1.09E-04	7.33E-05
1440	2.10E-04	1.16E-04	1.10E-04	7.23E-05
1470	2.14E-04	1.21E-04	1.12E-04	7.39E-05
1500	2.14E-04	1.24E-04	1.13E-04	7.45E-05

FLIGHT NO. C-463
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	2.14E-04	1.25E-04	1.20E-04	7.35E-05
1560	2.20E-04	1.31E-04	1.24E-04	7.18E-05
1590	2.23E-04	1.47E-04	1.25E-04	7.10E-05
1620	2.42E-04	1.51E-04	1.25E-04	6.91E-05
1650	2.39E-04	1.51E-04	1.24E-04	6.82E-05
1680	2.54E-04	1.52E-04	1.24E-04	6.93E-05
1710	2.63E-04	1.51E-04	1.24E-04	7.37E-05
1740	2.75E-04	1.48E-04	1.25E-04	7.73E-05
1770	2.72E-04	1.48E-04	1.24E-04	7.47E-05
1800	2.72E-04	1.33E-04	1.25E-04	7.41E-05
1830	2.68E-04	1.34E-04	1.27E-04	7.70E-05
1860	2.66E-04	1.34E-04	1.27E-04	8.10E-05
1890	2.64E-04	1.35E-04	1.29E-04	7.81E-05
1920	2.64E-04	1.35E-04	1.28E-04	8.37E-05
1950	2.63E-04	1.37E-04	1.26E-04	8.62E-05
1980	2.60E-04	1.46E-04	1.26E-04	8.87E-05
2010	2.60E-04	1.50E-04	1.30E-04	9.20E-05
2040	2.65E-04	1.52E-04	1.29E-04	9.26E-05
2070	2.65E-04	1.53E-04	1.31E-04	9.40E-05
2100	2.60E-04	1.57E-04	1.32E-04	9.63E-05
2130	2.65E-04	1.59E-04	1.34E-04	9.74E-05
2160	2.72E-04	1.61E-04	1.34E-04	9.60E-05
2190	2.70E-04	1.64E-04	1.34E-04	9.42E-05
2220	2.79E-04	1.63E-04	1.36E-04	9.68E-05
2250	2.81E-04	1.63E-04	1.35E-04	9.54E-05
2280	2.79E-04	1.65E-04	1.35E-04	9.56E-05
2310	2.78E-04	1.64E-04	1.36E-04	9.52E-05
2340	2.79E-04	1.61E-04	1.37E-04	9.72E-05
2370	2.77E-04	1.67E-04	1.39E-04	9.72E-05
2400	2.75E-04	1.68E-04	1.40E-04	9.75E-05
2430	2.72E-04	1.70E-04	1.40E-04	9.81E-05
2460	2.64E-04	1.68E-04	1.40E-04	9.66E-05
2490	2.63E-04	1.67E-04	1.40E-04	9.36E-05
2520	2.62E-04	1.66E-04	1.44E-04	9.09E-05
2550	2.62E-04	1.64E-04	1.46E-04	8.99E-05
2580	2.62E-04	1.67E-04	1.45E-04	9.05E-05
2610	2.61E-04	1.69E-04	1.46E-04	9.27E-05
2640	2.58E-04	1.66E-04	1.47E-04	9.33E-05
2670	2.54E-04	1.64E-04	1.53E-04	9.09E-05
2700	2.53E-04	1.64E-04	1.57E-04	9.03E-05
2730	2.51E-04	1.61E-04	1.61E-04	9.41E-05
2760	2.42E-04	1.61E-04	1.60E-04	9.83E-05
2790	2.36E-04	1.59E-04	1.27E-04	1.02E-04
2820	2.39E-04	1.56E-04	1.25E-04	1.04E-04
2850	2.40E-04	1.56E-04	1.29E-04	1.06E-04
2880	2.38E-04	1.55E-04	1.30E-04	1.07E-04
2910	2.31E-04	1.52E-04	1.31E-04	1.04E-04
2940	2.29E-04	1.44E-04	1.30E-04	9.96E-05
2970	2.29E-04	1.40E-04	1.36E-04	9.97E-05
3000	2.26E-04	1.43E-04	1.33E-04	9.64E-05

FLIGHT NO. C-463
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	2.30E-04	1.42E-04	1.35E-04	9.92E-05
3060	2.17E-04	1.46E-04	1.35E-04	9.90E-05
3090	2.22E-04	1.46E-04	1.34E-04	1.01E-04
3120	2.30E-04	1.42E-04	1.34E-04	9.93E-05
3150	2.27E-04	1.41E-04	1.34E-04	9.42E-05
3180	2.20E-04	1.39E-04	1.28E-04	8.60E-05
3210	2.26E-04	1.38E-04	1.22E-04	8.40E-05
3240	2.21E-04	1.37E-04	1.16E-04	8.17E-05
3270	2.14E-04	1.35E-04	1.10E-04	8.09E-05
3300	2.18E-04	1.34E-04	1.10E-04	8.03E-05
3330	2.18E-04	1.33E-04	1.05E-04	7.93E-05
3360	2.20E-04	1.31E-04	1.02E-04	8.00E-05
3390	2.14E-04	1.30E-04	1.01E-04	8.14E-05
3420	2.10E-04	1.29E-04	1.02E-04	7.97E-05
3450	2.06E-04	1.28E-04	9.93E-05	8.42E-05
3480	2.08E-04	1.26E-04	1.00E-04	8.43E-05
3510	2.09E-04	1.25E-04	9.75E-05	8.39E-05
3540	2.14E-04	1.24E-04	9.75E-05	8.19E-05
3570	2.77E-04	1.22E-04	9.39E-05	8.07E-05
3600	2.97E-04	1.21E-04	9.25E-05	7.82E-05
3630	2.94E-04	1.20E-04	9.27E-05	7.89E-05
3660	2.81E-04	1.18E-04	9.12E-05	7.68E-05
3690	2.07E-04	1.18E-04	9.19E-05	7.71E-05
3720	2.07E-04	1.13E-04	8.92E-05	7.44E-05
3750	2.07E-04	1.17E-04	9.08E-05	7.42E-05
3780	2.06E-04	1.14E-04	8.87E-05	7.40E-05
3810	1.95E-04	1.19E-04	8.98E-05	7.00E-05
3840	1.91E-04	1.23E-04	9.34E-05	6.73E-05
3870	1.90E-04	1.19E-04	9.39E-05	6.58E-05
3900	1.92E-04	1.19E-04	9.10E-05	6.02E-05
3930	1.95E-04	1.16E-04	8.23E-05	5.68E-05
3960	1.97E-04	1.09E-04	7.11E-05	5.74E-05
3990	1.99E-04	1.01E-04	7.05E-05	5.74E-05
4020	1.67E-04	1.01E-04	7.03E-05	5.76E-05
4050	1.68E-04	1.03E-04	7.02E-05	5.72E-05
4080	1.69E-04	1.01E-04	6.99E-05	5.73E-05
4110	1.67E-04	9.72E-05	6.94E-05	5.65E-05
4140	1.67E-04	9.62E-05	7.08E-05	5.82E-05
4170	1.66E-04	9.80E-05	7.06E-05	5.24E-05
4200	1.66E-04	9.85E-05	6.52E-05	5.29E-05
4230	1.67E-04	1.07E-04	6.53E-05	6.02E-05
4260	1.71E-04	1.16E-04	6.41E-05	6.73E-05
4290	1.75E-04	1.47E-04	6.47E-05	7.26E-05
4320	1.77E-04	1.48E-04	6.47E-05	7.13E-05
4350	1.71E-04	1.48E-04	6.37E-05	7.75E-05
4380	1.69E-04	1.46E-04	6.36E-05	7.75E-05
4410	1.71E-04	1.46E-04	6.32E-05	7.79E-05
4440	1.76E-04	1.47E-04	6.33E-05	8.00E-05
4470	1.80E-04	1.43E-04	6.37E-05	8.07E-05
4500	1.80E-04	1.42E-04	6.37E-05	8.13E-05

FLIGHT NO. C-463
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	1.80E-04	1.42E-04	6.38E-05	9.19E-05
4560	1.82E-04	1.37E-04	5.53E-05	9.08E-05
4590	1.83E-04	1.42E-04	6.62E-05	9.26E-05
4620	1.83E-04	1.63E-04	5.42E-05	9.05E-05
4650	1.85E-04	1.66E-04	5.41E-05	8.61E-05
4680	1.87E-04	1.75E-04	6.37E-05	9.58E-05
4710	1.90E-04	1.69E-04	6.34E-05	1.00E-04
4740	1.91E-04	1.70E-04	6.36E-05	1.03E-04
4770	1.94E-04	1.71E-04	7.26E-05	1.03E-04
4800	1.97E-04	1.76E-04	7.59E-05	1.03E-04
4830	1.94E-04	1.83E-04	7.65E-05	1.02E-04
4860	1.94E-04	1.83E-04	7.60E-05	1.01E-04
4890	2.06E-04	1.83E-04	7.66E-05	1.01E-04
4920	2.07E-04	1.81E-04	8.06E-05	9.78E-05
4950	2.08E-04	1.81E-04	8.46E-05	1.01E-04
4980	2.08E-04	1.65E-04	9.09E-05	1.01E-04
5010	2.09E-04	1.46E-04	9.19E-05	1.02E-04
5040	2.09E-04	1.32E-04	9.30E-05	1.02E-04
5070	2.10E-04	1.35E-04	9.19E-05	9.62E-05
5100	2.07E-04	1.32E-04	8.82E-05	9.57E-05
5130	2.01E-04	1.30E-04	8.64E-05	9.72E-05
5160	1.99E-04	1.31E-04	8.49E-05	1.00E-04
5190	2.01E-04	1.31E-04	8.38E-05	9.73E-05
5220	2.01E-04	1.37E-04	8.16E-05	9.89E-05
5250	2.01E-04	1.36E-04	8.08E-05	9.71E-05
5280	1.94E-04	1.36E-04	7.85E-05	9.06E-05
5310	1.85E-04	1.30E-04	7.37E-05	6.90E-05
5340	1.85E-04	1.26E-04	7.22E-05	7.15E-05
5370	1.86E-04	1.30E-04	7.00E-05	7.16E-05
5400	1.77E-04	1.27E-04	6.85E-05	6.76E-05
5430	1.76E-04	1.20E-04	7.04E-05	6.69E-05
5460	1.76E-04	1.21E-04	6.83E-05	6.63E-05
5490	1.73E-04	1.22E-04	7.05E-05	6.19E-05
5520	1.73E-04	1.15E-04	7.11E-05	6.05E-05
5550	1.73E-04	1.15E-04	7.18E-05	6.14E-05
5580	1.73E-04	1.14E-04	7.13E-05	6.23E-05
5610	1.71E-04	1.13E-04	6.95E-05	6.27E-05
5640	1.68E-04	1.12E-04	7.28E-05	6.16E-05
5670	1.66E-04	1.11E-04	8.13E-05	6.28E-05
5700	1.65E-04	1.11E-04	8.61E-05	5.82E-05
5730	1.52E-04	9.95E-05	8.42E-05	5.34E-05
5760	1.43E-04	9.55E-05	8.31E-05	5.35E-05
5790	1.39E-04	9.53E-05	7.92E-05	5.31E-05
5820	1.39E-04	9.47E-05	7.75E-05	5.06E-05
5850	1.28E-04	9.40E-05	7.73E-05	5.11E-05
5880	1.05E-04	9.11E-05	7.52E-05	4.77E-05
5910	1.03E-04	8.94E-05	7.47E-05	4.83E-05
5940	1.04E-04	8.60E-05	7.02E-05	4.89E-05
5970	1.05E-04	8.48E-05	6.86E-05	4.81E-05
6000	1.06E-04	8.50E-05	6.86E-05	4.70E-05

FLIGHT NO. C-463
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	1.07E-04	(8.47E-05)	6.73E-05	4.60E-05
6060	1.11E-04	(8.45E-05)	6.93E-05	4.32E-05
6090	1.12E-04	(8.42E-05)	6.86E-05	4.34E-05
6120	(1.12E-04)	(8.39E-05)	(6.84E-05)	(4.32E-05)
6150	(1.12E-04)	(8.36E-05)	(6.82E-05)	(4.31E-05)
6180	(1.11E-04)	(8.34E-05)	(6.80E-05)	(4.29E-05)
6210	(1.11E-04)	(8.31E-05)	(6.77E-05)	(4.28E-05)
6240	(1.11E-04)	(8.28E-05)	(6.75E-05)	(4.27E-05)
6270	(1.10E-04)	(8.26E-05)	(6.73E-05)	(4.25E-05)
6300	(1.10E-04)	(8.23E-05)	(6.71E-05)	(4.24E-05)
FIRST DATA ALT	90	120	150	120
LAST DATA ALT	6090	6000	6090	6090

FLIGHT NO. C-463
EQUIVALENT ATTENUATION LENGTH

(JOB 4178 DATE 05/27/80)
DATE 80778 FLIGHT NO. C-463 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	3.98E 03	5.86E 03	8.95E 03	8.51E 03
300	4.29E 03	6.43E 03	9.92E 03	8.82E 03
600	4.49E 03	6.91E 03	1.13E 04	9.68E 03
900	4.50E 03	6.84E 03	1.13E 04	1.08E 04
1200	4.31E 03	7.06E 03	1.10E 04	1.14E 04
1500	4.34E 03	7.28E 03	1.06E 04	1.18E 04
1800	4.30E 03	7.23E 03	1.01E 04	1.21E 04
2100	4.22E 03	7.20E 03	9.57E 03	1.20E 04
2400	4.14E 03	7.05E 03	9.31E 03	1.18E 04
2700	4.10E 03	6.91E 03	8.95E 03	1.17E 04
3000	4.11E 03	6.87E 03	8.76E 03	1.15E 04
3300	4.14E 03	6.89E 03	8.67E 03	1.14E 04
3600	4.17E 03	6.96E 03	8.77E 03	1.15E 04
3900	4.20E 03	7.06E 03	8.90E 03	1.16E 04
4200	4.27E 03	7.20E 03	9.14E 03	1.19E 04
4500	4.35E 03	7.20E 03	9.40E 03	1.20E 04
4800	4.40E 03	7.14E 03	9.63E 03	1.19E 04
5100	4.43E 03	7.07E 03	9.73E 03	1.18E 04
5400	4.46E 03	7.09E 03	9.86E 03	1.18E 04
5700	4.52E 03	7.16E 03	1.00E 04	1.19E 04
6000	4.62E 03	7.28E 03	1.01E 04	1.22E 04
6300	4.73E 03	7.42E 03	1.03E 04	1.25E 04

FLIGHT NO. C-463
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.32E-01	9.54E-01	9.70E-01	9.67E-01
600	8.75E-01	9.17E-01	9.48E-01	9.40E-01
900	8.19E-01	8.77E-01	9.23E-01	9.20E-01
1200	7.57E-01	8.44E-01	8.97E-01	9.00E-01
1500	7.08E-01	8.14E-01	8.69E-01	8.81E-01
1800	6.58E-01	7.80E-01	8.36E-01	8.62E-01
2100	6.08E-01	7.47E-01	8.05E-01	8.40E-01
2400	5.60E-01	7.11E-01	7.73E-01	8.16E-01
2700	5.17E-01	6.77E-01	7.40E-01	7.94E-01
3000	4.82E-01	6.46E-01	7.10E-01	7.70E-01
3300	4.51E-01	6.19E-01	6.83E-01	7.49E-01
3600	4.21E-01	5.96E-01	6.63E-01	7.31E-01
3900	3.95E-01	5.75E-01	6.45E-01	7.15E-01
4200	3.74E-01	5.58E-01	6.31E-01	7.03E-01
4500	3.55E-01	5.35E-01	6.19E-01	6.88E-01
4800	3.36E-01	5.11E-01	6.07E-01	6.69E-01
5100	3.16E-01	4.86E-01	5.92E-01	6.49E-01
5400	2.98E-01	4.67E-01	5.78E-01	6.32E-01
5700	2.83E-01	4.51E-01	5.66E-01	6.20E-01
6000	2.73E-01	4.39E-01	5.53E-01	6.11E-01
6300	2.64E-01	4.28E-01	5.42E-01	6.03E-01

FLIGHT C-464 - 14 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1159	1238	0.65	37.7	-	39.2	90	2130
4,5	124'	1322	0.65	39.5	-	42.6	90	1500

Flight Description. Flight C-464 was an afternoon flight with take off at 1101 GMT and tape ending about 1323 GMT. It was one of two data packages collected on this date. The second data package was obtained over the Meppen track later in the afternoon after increasing cloudiness caused the curtailment of activities on the Soesterberg track. The flight was conducted under overcast skies. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer at 1200 GMT at 300 meters (1000 feet) noted broken altostratus and high overcast cirrus clouds with slant range 16 kilometers (10 miles) in light to moderate haze. It had rained earlier in the morning but there was no rain at this time and the ground was dry. During the descent a distinct haze top appeared about 600 meters (2000 feet). Very low altitude haze layer top is 600 to 690 meters (2000 to 2300 feet) and is gray-brown in color. There was light haze to the 2400 meter (8000 feet) cloud bases. The overcast clouds are beginning to show breaks and we should be able to complete 2+2 before cloud cover breaks up too much. Very light precipitation encountered above 1500 meters (5000 feet). Virgo visible to south and west. At 1225 GMT on the ST&LV 30 seconds of virga were encountered early in the track; rest in light haze under overcast; clouds are breaking up significantly to south and west. Cumulus at 300 meters (1000 feet) is moving in from the west At 1225 GMT at 1500 meters (5000 feet) there was broken altostratus at 2100 meters (7000 feet) and high overcast cirrostratus with slant range varying from 9.6 to 24 kilometers (6 to 15 miles) in light haze. At 1240 GMT at 300 meters (1000 feet) the clouds remained the same as previous observation; slant range 16 kilometers (10 miles) in light to moderate haze. Haze appears denser on west end of track than on east end - may be a function of urban vs rural environment. At 1305 GMT at 1500 meters (5000 feet) broken altostratus was observed at 2100 meters (7000 feet), broken altocumulus at 3000 meters (10,000 feet) and high overcast cirrostratus. At the west end of the track there was stratocumulus at 450 meters (1500 feet). Slant range was 16 kilometers (10 miles). There were isolated patches of Sc along the east half and isolated occurrences of virga at 1500 meters (5000 feet). On the last descent haze top was 750 meters (2500 feet) with virga from 900 to 600 meters (3000 to 2000 feet).

Local Weather Notes. DeBilt, 32.1 kilometers northwest of the track center, reported 4/8 to 2/8 cumulus and stratocumulus at 450 to 600 meters (1500 to 2000 feet) and 7/8 to 6/8 altocumulus at 3000 to 3600 meters (10,000 to 12,000 feet). Visibility of 7 kilometers in haze improved to 20 kilometers by 1200 GMT.

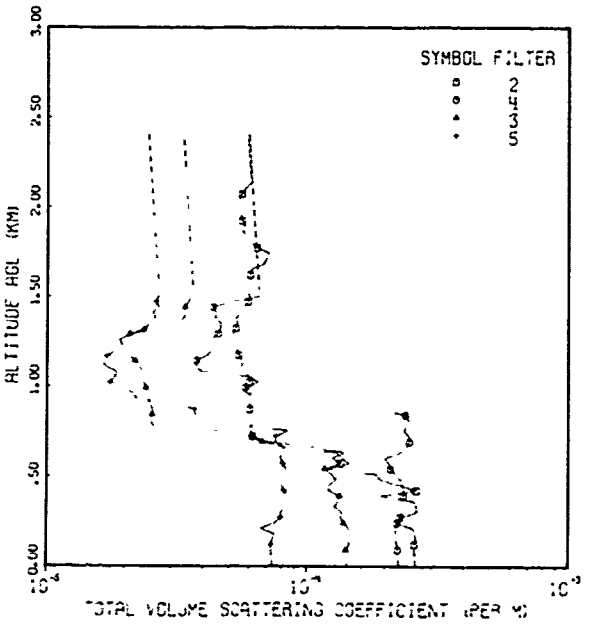
Soesterberg, 30.3 kilometers northwest of the track center reported 7/8 decreasing to 4/8 cumulus and stratocumulus at 1500 meters (5000 feet) and 7/8 altocumulus at 3000 meters (10,000 feet) with visibility ranging from 6 kilometers in haze to 15 kilometers.

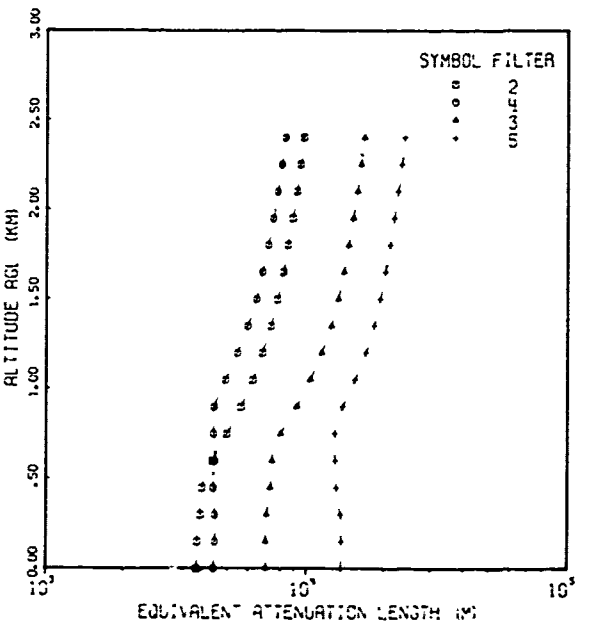
Deelen 26.3 kilometers northeast of the track center, reported 1/8 to 3/8 cumulus and stratocumulus at 750 meters (2500 feet) and 7/8 altocumulus at 2700 meters (9000 feet) with visibility 9 to 15 kilometers.

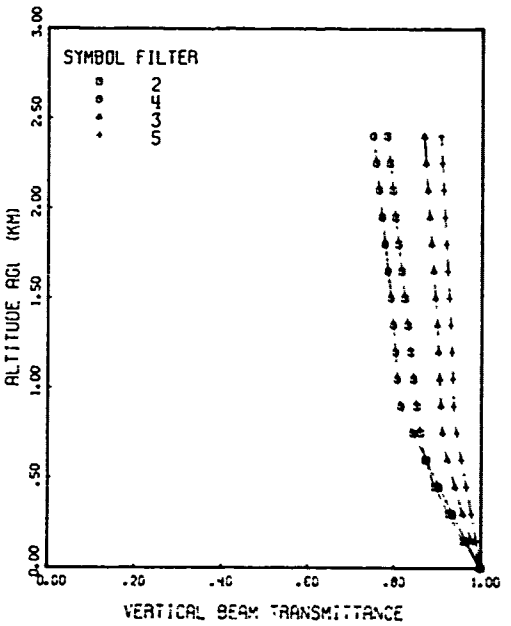
The radiosonde station at DeBilt was northwest and 32.1 kilometers upstream from the track. The 1200 raob was warmer at all levels than the 0000 GMT sounding. There was also increasing moisture from 800 to 440 millibars.

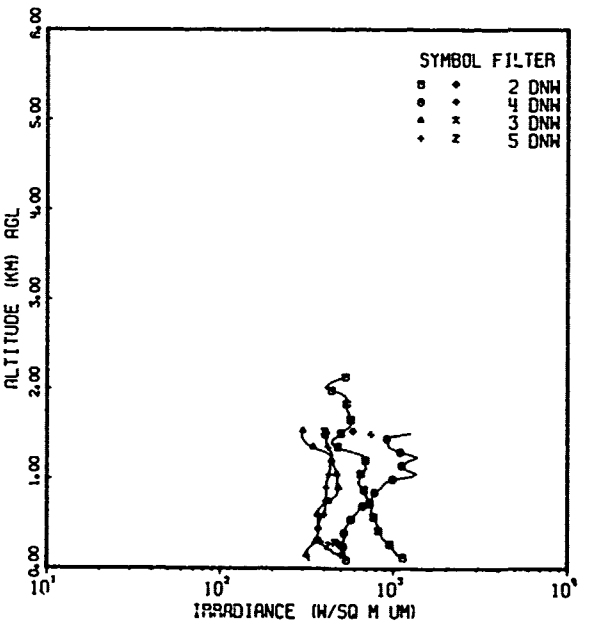
Synoptic Remarks. The surface chart for 0000 GMT indicated a weak ridge of the Atlantic High extended through northern France and southern Germany. There was an occluded front that extended from south of Iceland southeastward to northern Ireland then south and southwest as a cold front through western Ireland into the Atlantic. A warm front, part of this same system, extended from northern Ireland southward into the Irish Sea. There was also a 1016 millibar low centered in the northern Adriatic. At 1200 GMT there was a high centered near Berlin with the 1016 millibar isobar enclosing most of continental Europe. An occluded front extended from south of Iceland southeastward to Scotland, then as a cold front southward through the eastern Irish Sea into th. Atlantic. The warm front part of this system extended from Scotland southeastward to the North Sea. There was light westerly surface flow over the track. The 500 millibar chart for 0000 GMT had ridging from the Bay of Biscay to Scotland with the track on the leading side with moderate northwesterly winds. At 1200 GMT there was ridging from Algeria northward through the North Sea. The track had moderate westnorthwesterly winds at this level. The air mass was maritime polar. The satellite map was difficult to define with clouds over most of Europe except for southern France, Sardinia and Sicily. The computer printout maps showed broken to overcast cumulus, stratocumulus, altocumulus and cirrus over the area.

FLIGHT NO. C-464
SOESTERBERG









FLIGHT NO. C-464
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4309 DATE 05/19/80)
DATE 81478 FLIGHT NO. C-464 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.63E-04)	(2.27E-04)	(1.43E-04)	(7.37E-05)
30	(2.61E-04)	(2.26E-04)	(1.42E-04)	(7.34E-05)
60	(2.61E-04)	(2.25E-04)	(1.42E-04)	(7.32E-05)
90	(2.60E-04)	2.25E-04	1.42E-04	(7.30E-05)
120	2.59E-04	2.23E-04	1.46E-04	7.28E-05
150	2.64E-04	2.20E-04	1.45E-04	7.37E-05
180	2.60E-04	2.20E-04	1.47E-04	7.49E-05
210	2.56E-04	2.19E-04	1.45E-04	6.64E-05
240	2.23E-04	2.22E-04	1.39E-04	7.56E-05
270	2.29E-04	2.31E-04	1.35E-04	7.93E-05
300	2.65E-04	2.33E-04	1.36E-04	7.92E-05
330	2.64E-04	2.32E-04	1.28E-04	8.26E-05
360	2.57E-04	2.33E-04	1.32E-04	8.38E-05
390	1.91E-04	2.35E-04	1.34E-04	8.44E-05
420	2.63E-04	2.36E-04	1.21E-04	8.16E-05
450	2.29E-04	2.33E-04	1.21E-04	7.95E-05
480	1.91E-04	2.30E-04	1.29E-04	7.84E-05
510	1.84E-04	2.20E-04	1.24E-04	7.93E-05
540	1.19E-04	2.09E-04	1.17E-04	8.30E-05
570	1.35E-04	2.06E-04	1.46E-04	8.07E-05
600	1.25E-04	1.99E-04	1.35E-04	7.86E-05
630	1.39E-04	2.28E-04	1.29E-04	7.92E-05
660	1.06E-04	2.42E-04	8.18E-05	8.11E-05
690	6.97E-05	2.48E-04	6.72E-05	7.53E-05
720	6.17E-05	2.47E-04	6.02E-05	7.58E-05
750	6.07E-05	2.37E-04	4.45E-05	8.43E-05
780	6.09E-05	2.40E-04	2.54E-05	5.33E-05
810	6.04E-05	2.47E-04	2.50E-05	4.68E-05
840	6.05E-05	2.39E-04	2.53E-05	3.69E-05
870	6.02E-05	1.98E-04	2.54E-05	3.68E-05
900	6.01E-05	1.33E-04	2.48E-05	2.84E-05
930	6.00E-05	7.64E-05	2.45E-05	2.21E-05
960	6.01E-05	5.77E-05	2.41E-05	2.13E-05
990	6.03E-05	5.77E-05	2.40E-05	1.92E-05
1020	6.01E-05	6.47E-05	2.35E-05	1.74E-05
1050	5.99E-05	6.03E-05	2.34E-05	1.83E-05
1080	5.72E-05	3.90E-05	2.35E-05	1.85E-05
1110	5.59E-05	3.73E-05	2.25E-05	1.63E-05
1140	5.59E-05	3.75E-05	2.18E-05	1.63E-05
1170	5.43E-05	4.12E-05	2.06E-05	1.71E-05
1200	5.34E-05	4.30E-05	2.01E-05	1.85E-05
1230	5.29E-05	4.34E-05	2.04E-05	1.94E-05
1260	5.15E-05	4.30E-05	2.06E-05	1.89E-05
1290	5.14E-05	4.52E-05	2.08E-05	2.12E-05
1320	5.29E-05	4.61E-05	2.62E-05	2.37E-05
1350	5.35E-05	4.63E-05	3.00E-05	2.49E-05
1380	5.31E-05	4.40E-05	3.37E-05	2.60E-05
1410	5.57E-05	4.45E-05	3.35E-05	2.54E-05
1440	5.78E-05	4.32E-05	3.38E-05	2.68E-05
1470	5.92E-05	5.11E-05	3.51E-05	2.61E-05
1500	5.99E-05	6.52E-05	3.56E-05	2.68E-05

FLIGHT NO. C-464
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4309 DATE 05/19/80)
DATE 81478 FLIGHT NO. C-464 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	5.9CE-05	(6.50E-05)	3.61E-05	(2.67E-05)
1560	5.93E-05	(6.48E-05)	(3.60E-05)	(2.66E-05)
1590	6.03E-05	(6.46E-05)	(3.59E-05)	(2.65E-05)
1620	6.03E-05	(6.44E-05)	(3.58E-05)	(2.64E-05)
1650	6.07E-05	(6.42E-05)	(3.57E-05)	(2.64E-05)
1680	6.81E-05	(6.40E-05)	(3.56E-05)	(2.63E-05)
1710	6.95E-05	(6.38E-05)	(3.55E-05)	(2.62E-05)
1740	7.09E-05	(6.36E-05)	(3.54E-05)	(2.61E-05)
1770	6.39E-05	(6.34E-05)	(3.53E-05)	(2.60E-05)
1800	6.08E-05	(6.32E-05)	(3.52E-05)	(2.59E-05)
1830	5.86E-05	(6.30E-05)	(3.50E-05)	(2.59E-05)
1860	5.60E-05	(6.28E-05)	(3.49E-05)	(2.58E-05)
1890	5.72E-05	(6.27E-05)	(3.48E-05)	(2.57E-05)
1920	5.58E-05	(6.25E-05)	(3.47E-05)	(2.56E-05)
1950	5.51E-05	(6.23E-05)	(3.46E-05)	(2.55E-05)
1980	5.48E-05	(6.21E-05)	(3.45E-05)	(2.55E-05)
2010	5.47E-05	(6.19E-05)	(3.44E-05)	(2.54E-05)
2040	5.45E-05	(6.17E-05)	(3.43E-05)	(2.53E-05)
2070	5.57E-05	(6.15E-05)	(3.42E-05)	(2.52E-05)
2100	5.74E-05	(6.13E-05)	(3.41E-05)	(2.51E-05)
2130	6.06E-05	(6.11E-05)	(3.40E-05)	(2.51E-05)
2160	(6.04E-05)	(6.09E-05)	(3.39E-05)	(2.50E-05)
2190	(6.02E-05)	(6.07E-05)	(3.37E-05)	(2.49E-05)
2220	(6.00E-05)	(6.05E-05)	(3.36E-05)	(2.48E-05)
2250	(5.98E-05)	(6.03E-05)	(3.35E-05)	(2.48E-05)
2280	(5.96E-05)	(6.01E-05)	(3.34E-05)	(2.47E-05)
2310	(5.94E-05)	(6.00E-05)	(3.33E-05)	(2.46E-05)
2340	(5.92E-05)	(5.98E-05)	(3.32E-05)	(2.45E-05)
2370	(5.91E-05)	(5.96E-05)	(3.31E-05)	(2.44E-05)
2400	(5.89E-05)	(5.94E-05)	(3.30E-05)	(2.44E-05)
FIRST DATA ALT	120	90	90	120
LAST DATA ALT	2130	1500	1530	1500

FLIGHT NO. C-464
EQUIVALENT ATTENUATION LENGTH

(JOB 4309 DATE 05/19/80)
DATE 81478 FLIGHT NO. C-464 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	3.81E 03	4.41E 03	5.99E 03	1.36E 04
300	3.94E 03	4.46E 03	7.04E 03	1.35E 04
600	4.38E 03	4.45E 03	7.38E 03	1.29E 04
900	5.62E 03	4.42E 03	9.17E 03	1.38E 04
1200	6.76E 03	5.45E 03	1.14E 04	1.69E 04
1500	7.74E 03	6.41E 03	1.32E 04	1.92E 04
1800	8.46E 03	7.10E 03	1.45E 04	2.09E 04
2100	9.15E 03	7.72E 03	1.55E 04	2.24E 04
2400	9.70E 03	8.27E 03	1.66E 04	2.37E 04

FLIGHT NO. C-464
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.27E-01	9.35E-01	9.58E-01	9.78E-01
600	8.72E-01	8.74E-01	9.22E-01	9.55E-01
900	8.52E-01	8.16E-01	9.06E-01	9.37E-01
1200	8.37E-01	8.02E-01	9.00E-01	9.31E-01
1500	8.24E-01	7.91E-01	8.93E-01	9.25E-01
1800	8.08E-01	7.76E-01	8.83E-01	9.18E-01
2100	7.95E-01	7.62E-01	8.74E-01	9.11E-01
2400	7.81E-01	7.48E-01	8.65E-01	9.04E-01

FLIGHT C-465 - 14 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1358	1434	0.60	48.0	-	52.5	90	1500
4,5	1440	1510	0.50	53.1	-	57.4	90	1290

Flight Description. Flight C-465 was an afternoon with tape commencing about 1355 and landing at 1536 GMT. This was the second of two data packages collected on this date. Earlier in the afternoon data were collected over the Soesterberg track. The flight was conducted under overcast skies. The approximate northeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns.

In-Flight Notes. The in-flight observer noted at 1400 GMT at 300 meters (1000 feet) an overcast stratus deck at 1650 meters (5500 feet) with slant range of 16 kilometers (10 miles) in moderate haze. It was very uniform under the 1500 meter (5000 feet) overcast - nice - no virga visible. At 1413 GMT on the climb the top of the surface based haze was about 900 meters (3000 feet); appears lighter than (less dense) haze at Soesterberg. Gray appearance, low level clouds were moving in from the west. At 1420 GMT patches of cloud penetrated in last 20 seconds of first filter; second filter was entirely clear. Also at 1420 GMT at 1500 meters (5000 feet) there was overcast stratus at 1650 meters (5500 feet) and slant range of 16 kilometers (10 miles) in light haze. At 1440 GMT at 300 meters (1000 feet) overcast stratus deck was at 1500 meters (5000 feet) and slant range of 32 kilometers (20 miles) in moderate haze. Visibility had improved - seems darker - perhaps time of day but probable overcast density. At 1450 GMT haze top had increased slightly to 990 meters (3300 feet). Note - burning field to south of midpoint of track may appear on 300 meters (1000 feet) data. At 1500 GMT at 1350 meters (4500 feet) there was a broken stratofractus deck at 1500 meters (5000 feet) and an overcast stratus deck at 1650 meters (5500 feet), slant range was 16 to 24 kilometers (10 to 15 miles) in light haze. On the last descent there definitely appeared to be a region from 300 to 450 meters (1000 to 1500 feet) where visibility was much less than either above or below.

Local Weather Notes. Bremerhaven, 87.1 kilometers northeast of the track center, reported overcast stratocumulus at 600 meters (2000 feet) with visibility of 4.5 kilometers in light rain at 1400 GMT and 7.0 kilometers in light fog at 1500 GMT.

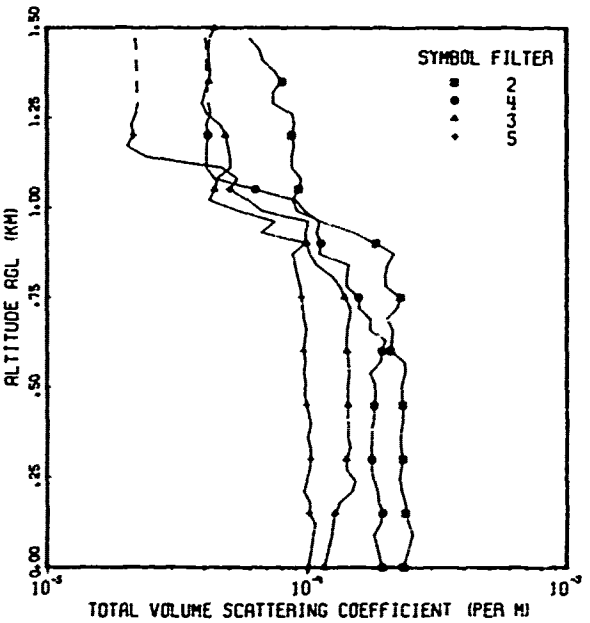
Emden, 45.7 kilometers southwest of the track center, recorded 4/8 stratocumulus at 450 meters (1500 feet) and overcast altostratus at 3000 meters (10,000 feet) with visibility 4.0 kilometers in light rain during the flight period.

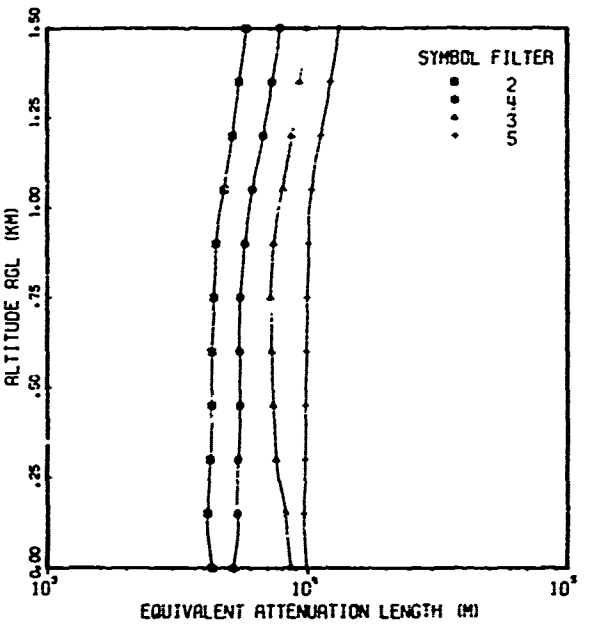
Bremen, 79.3 kilometers east of the track center, reported 5/8 stratocumulus at 900 meters (3000 feet) and overcast altostratus at 3000 meters (10,000 feet) with visibility 11.2 kilometers at 1320 GMT. Conditions improved gradually becoming 2/8 stratocumulus at 1260 meters (4200 feet) 7/8 altocumulus at 3000 meters (10,000 feet) and 18 kilometers visibility by 1500 GMT.

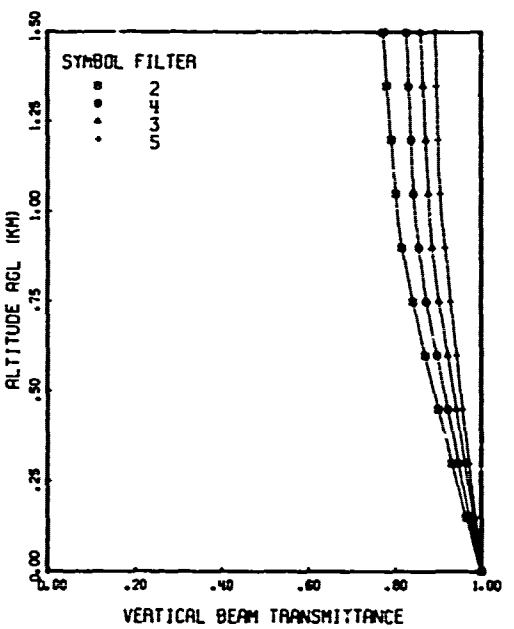
The radiosonde station at Bergen was 149 kilometers east and downstream from the track. The sounding was colder and moister than the one at DeBilt, the station nearer to the Soesterberg track.

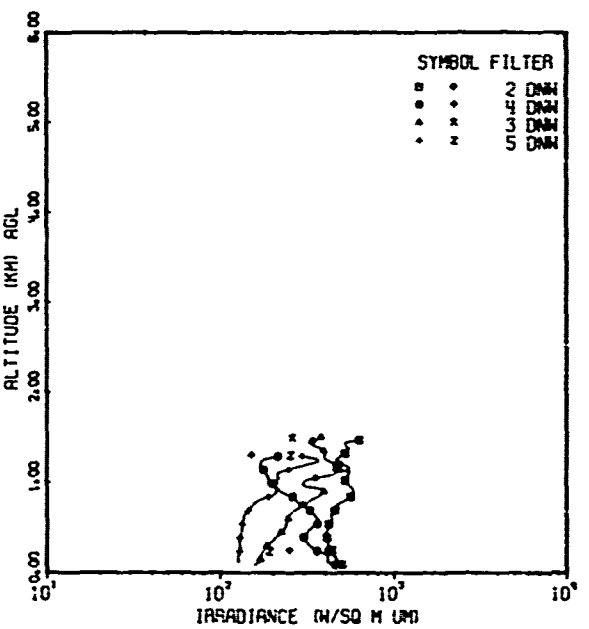
Synoptic Remarks. The surface chart for 0000 GMT indicated a weak ridge of the Atlantic High extended through northern France and southern Germany. There was an occluded front that extended from south of Iceland southeastward to northern Ireland then south and southwest as a cold front through western Ireland into the Atlantic. A warm front, part of this same system, extended from northern Ireland southward into the Irish Sea. There was also a 1016 millibar low centered in the northern Adriatic. At 1200 GMT there was a high centered near Berlin with the 1016 millibar isobar enclosing most of continental Europe. An occluded front extended from south of Iceland southeastward to Scotland, then as a cold front southward through the eastern Irish Sea into the Atlantic. The warm front part of this system extended from Scotland southeastward to the North Sea. There was light westerly surface flow over the track. The 500 millibar chart for 0000 GMT had ridging from the Bay of Biscay to Scotland with the track on the leading side with moderate northwesterly winds. At 1200 GMT there was ridging from Algeria northward through the North Sea. The track had moderate westnorthwesterly winds at this level. The air mass was maritime polar. The satellite map was difficult to define with clouds over most of Europe except for southern France, Sardinia and Sicily. The computer printout maps showed broken to overcast cumulus, stratocumulus, altocumulus and cirrus over the area.

FLIGHT NO. C-465
SOESTERBERG









FLIGHT NO. C-465
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5196 DATE 05/16/80)
DATE 81478 FLIGHT NO. C-465 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	2.34E-04	1.94E-04	1.16E-04	1.01E-04
30	2.41E-04	1.89E-04	1.19E-04	1.02E-04
60	2.47E-04	1.84E-04	1.22E-04	1.04E-04
90	2.54E-04	1.80E-04	1.24E-04	1.05E-04
120	2.45E-04	1.91E-04	1.25E-04	1.07E-04
150	2.37E-04	1.94E-04	1.27E-04	1.01E-04
180	2.37E-04	1.88E-04	1.34E-04	1.02E-04
210	2.30E-04	1.86E-04	1.49E-04	9.68E-05
240	2.26E-04	1.80E-04	1.53E-04	9.99E-05
270	2.29E-04	1.77E-04	1.42E-04	1.03E-04
300	2.32E-04	1.77E-04	1.41E-04	1.03E-04
330	2.28E-04	1.76E-04	1.46E-04	1.03E-04
360	2.27E-04	1.76E-04	1.43E-04	1.00E-04
390	2.30E-04	1.76E-04	1.43E-04	1.03E-04
420	2.33E-04	1.81E-04	1.43E-04	1.01E-04
450	2.32E-04	1.80E-04	1.43E-04	9.93E-05
480	2.29E-04	1.82E-04	1.42E-04	9.74E-05
510	2.31E-04	1.82E-04	1.44E-04	9.86E-05
540	2.37E-04	1.74E-04	1.45E-04	9.63E-05
570	2.36E-04	1.91E-04	1.43E-04	9.80E-05
600	2.09E-04	1.93E-04	1.42E-04	9.68E-05
630	2.11E-04	2.00E-04	1.42E-04	9.80E-05
660	2.12E-04	1.74E-04	1.42E-04	9.92E-05
690	2.02E-04	1.74E-04	1.45E-04	9.66E-05
720	2.22E-04	1.58E-04	1.46E-04	9.58E-05
750	2.28E-04	1.58E-04	1.39E-04	9.51E-05
780	2.00E-04	1.42E-04	1.33E-04	9.37E-05
810	1.98E-04	1.42E-04	1.23E-04	9.11E-05
840	2.02E-04	1.44E-04	1.08E-04	8.93E-05
870	2.16E-04	1.11E-04	1.02E-04	8.79E-05
900	1.83E-04	1.13E-04	9.92E-05	9.87E-05
930	1.51E-04	1.08E-04	6.65E-05	9.82E-05
960	1.14E-04	1.12E-04	7.52E-05	1.01E-04
990	9.18E-05	9.80E-05	5.43E-05	6.76E-05
1020	8.81E-05	9.01E-05	4.21E-05	5.93E-05
1050	9.26E-05	6.33E-05	4.40E-05	5.04E-05
1080	9.50E-05	4.43E-05	4.52E-05	5.41E-05
1110	8.76E-05	4.10E-05	5.09E-05	4.74E-05
1140	8.71E-05	4.10E-05	5.05E-05	2.43E-05
1170	8.90E-05	4.10E-05	4.94E-05	2.03E-05
1200	8.70E-05	4.14E-05	4.85E-05	2.14E-05
1230	8.95E-05	4.11E-05	4.65E-05	2.11E-05
1260	8.76E-05	4.25E-05	4.11E-05	2.20E-05
1290	7.37E-05	4.16E-05	3.93E-05	2.23E-05
1320	7.40E-05	(4.15E-05)	4.05E-05	(2.22E-05)
1350	8.04E-05	(4.13E-05)	4.21E-05	(2.22E-05)
1380	7.47E-05	(4.12E-05)	4.23E-05	(2.21E-05)
1410	6.75E-05	(4.11E-05)	4.19E-05	(2.20E-05)
1440	6.53E-05	(4.10E-05)	4.16E-05	(2.19E-05)
1470	6.04E-05	(4.08E-05)	4.22E-05	(2.19E-05)
1500	(6.02E-05)	(4.07E-05)	4.43E-05	(2.18E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	1470	1290	1500	1290

FLIGHT NO. C-465
EQUIVALENT ATTENUATION LENGTH

(JOB 5196 DATE 05/16/80)
DATE 81478 FLIGHT NO. C-465 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	4.27E 03	5.15E 03	8.62E 03	9.90E 03
300	4.20E 03	5.39E 03	7.56E 03	9.77E 03
600	4.27E 03	5.47E 03	7.26E 03	9.90E 03
900	4.43E 03	5.76E 03	7.39E 03	1.01E 04
1200	5.13E 03	6.75E 03	8.68E 03	1.13E 04
1500	5.85E 03	7.89E 03	9.93E 03	1.33E 04

FLIGHT NO. C-465
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.31E-01	9.46E-01	9.61E-01	9.70E-01
600	8.69E-01	8.96E-01	9.21E-01	9.41E-01
900	8.16E-01	8.55E-01	8.85E-01	9.15E-01
1200	7.91E-01	8.37E-01	8.71E-01	8.99E-01
1500	7.74E-01	8.27E-01	8.60E-01	8.93E-01

FLIGHT C-466 - 15 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0919	1056	1.62	47.1	-	39.6	90	6000
4,5	1104	1303	1.98	39.4	38.9	42.8	90	5910

Flight Description. Flight C-466 was a midday flight spanning local apparent noon with take off at 0833 and landing at 1342 GMT. There were scattered cirrus clouds and a low level haze layer. The approximate northeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns

In-Flight Notes. The in-flight observer generalized that there were muted horizontal blue-gray striations and isolated contrails. On the climbout from Wunstorf the surface based haze layer top is 1350 meters (4500 feet) in the Wunstorf area with a clear layer to 1800 meters (6000 feet) and a similar haze layer from 1800 meters (6000 feet) to an unknown upper altitude. Isolated patches of altocumulus at above 4200 meters (14,000 feet) with scattered thin cirrus at much higher altitude. On the descent, top of the haze layer was 1350 meters (4500 feet); apparent best altitudes: 300, 1200, 3000 and 6000 meters (1000, 4000, 10,000 and 20,000 feet). Beautiful day, only thin cirrus are a hindrance. At 0920 GMT at 300 meters (1000 feet) scattered cirrus at 9000 meters (30,000 feet) slant range 16 kilometers (10 miles) in moderate haze. At 0945 GMT and 1200 meters (4000 feet) slant range 19.2 kilometers (12 miles). At 0955 GMT on the climb the haze top was 1350 to 1500 meters (4500 to 5000 feet), clear layer 1500 to 1950 meters (5000 to 6500 feet), mostly clear to 2400 meters (8000 feet), distinct top at 2700 meters (9000 feet); thin layer at 2940 meters (9800 feet). At 1005 GMT and 3000 meters (10,000 feet) scattered cirrus at 9000 meters (30,000 feet) with isolated cumulus starting and slant range 24 kilometers (15 miles) in light haze On the climb from 3000 to 6000 meters (10,000 to 20,000 feet) there were multiple thin layers visible from 3000 to 5100 meters (10,000 to 17,000 feet) with a distinct layer visible from 4650 to 2950 meters (15,500 to 16,500 feet). During the remainder of the flight the cirrus continued with cumulus at 900 meters (3000 feet) on the west end of the track Visibility improved during the course of the mission with the haze still moderate and the top remaining at 1350 meters (4500 feet). The flight at 6000 meters (20,000 feet) was not above the highest haze layer.

Local Weather Notes. Bremerhaven, 87.1 kilometers northeast of the track center, reported 1/8 altocumulus at 4500 meters and 3/8 to 4/8 high thin cirrus with visibility 7 to 18 kilometers.

Emden, 45.7 kilometers northwest of the track center, recorded 1/8 high thin cirrus with 3/8 stratocumulus at 1050 meters (3500 feet) at the 1400 GMT observation. Visibility varied from 6 kilometers in haze to 15 kilometers.

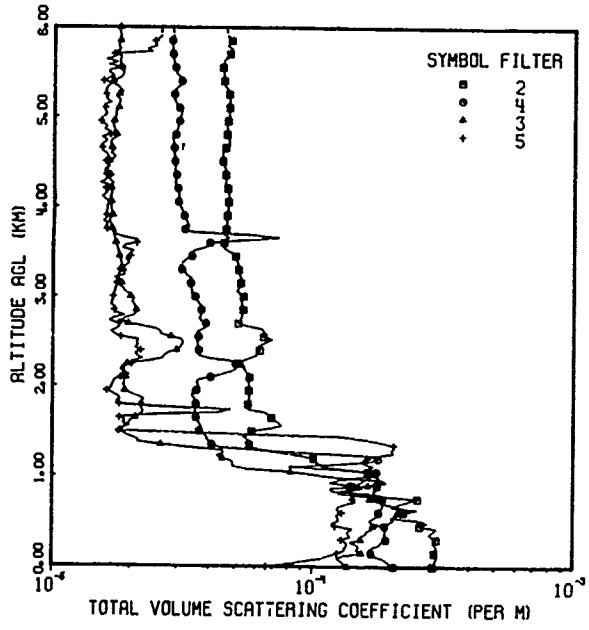
Bremen, 79.3 kilometers east of the track center, reported 1/8 altocumulus at 4500 meters (15,000 feet) before 1000 GMT with 1/8 to 2/8 high thin cirrus through the day. Visibility, when reported varied from 11.2 to 18 kilometers.

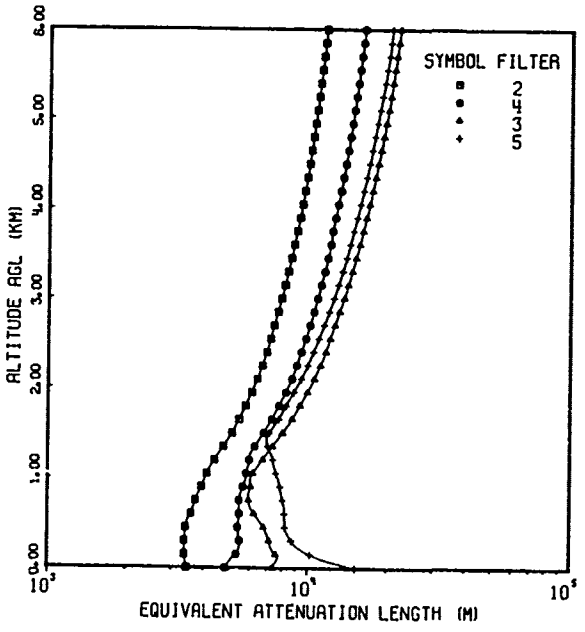
The radiosonde station at Bergen was 149 kilometers east and downstream from the track. The sounding indicated that lower level winds were moderate southerly becoming southwest above 800 millibars. The sounding was fairly dry and much warmer at lower levels than 24 hours ago.

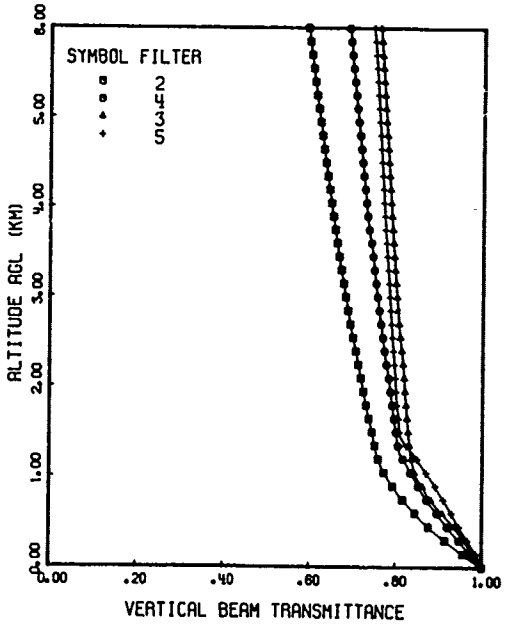
Synoptic Remarks. The surface chart for 0000 GMT had an occlusion north of Scotland into the North Sea. A cold front extended from the North Sea southsouthwest through Leeds to Plymouth and then southwest into the eastern Atlantic. The warm front part of the system extended southsoutheast from the North Sea to northern Denmark. There was a 1021 millibar high centered in the Ukraine that dominated most of the European continent and western Russia except for a small low in eastern Spain. At 1200 GMT the occlusion in the North Sea with the cold front extending southsouthwest was approaching the coast of The Netherlands and then extended southwest through northwestern France and into the Atlantic. The track was in southwesterly surface flow in advance of the front. At 500 millibars at 0000 GMT there was ridging from Algeria northnortheast to southern Scandinavia The track had light to moderate northwesterly winds. There was also a closed low west of northern Ireland. By 1200 GMT there was ridging from Tunisia to southern Scandinavia and the low center continued west of northern Ireland. At this level flow over the track was moderate westerly. The air mass was modified maritime polar. The satellite map showed clouds over most of Europe except thin clouds over the low countries and Italy.

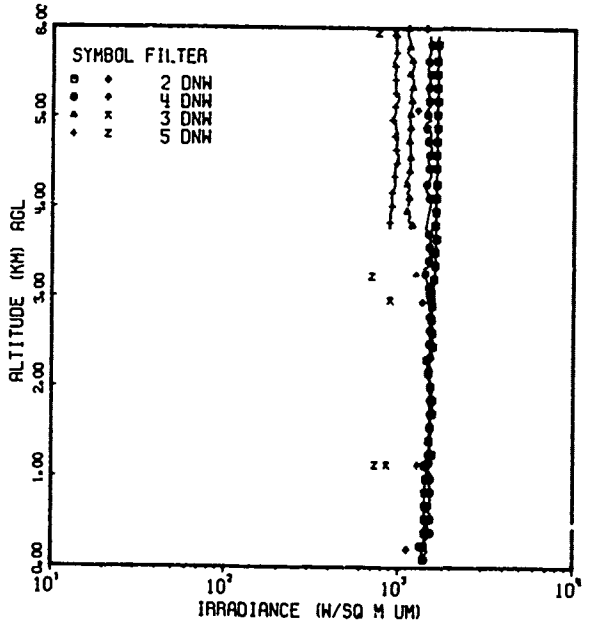
FLIGHT NO. C-466

MEPPEN









FLIGHT NO. C-466
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5195 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-466 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	2.91E-04	2.07E-04	1.36E-04	5.61E-05
30	2.94E-04	2.00E-04	1.32E-04	7.98E-05
60	2.98E-04	1.94E-04	1.28E-04	9.34E-05
90	3.01E-04	1.87E-04	1.25E-04	1.07E-04
120	3.01E-04	1.70E-04	1.31E-04	1.15E-04
150	2.95E-04	1.69E-04	1.55E-04	1.25E-04
180	2.95E-04	1.67E-04	1.48E-04	1.33E-04
210	3.02E-04	1.71E-04	1.50E-04	1.33E-04
240	2.97E-04	1.81E-04	1.49E-04	1.36E-04
270	2.92E-04	1.85E-04	1.40E-04	1.35E-04
300	3.01E-04	1.93E-04	1.54E-04	1.29E-04
330	2.90E-04	1.92E-04	1.52E-04	1.40E-04
360	2.82E-04	1.91E-04	1.61E-04	1.37E-04
390	2.92E-04	1.91E-04	1.62E-04	1.37E-04
420	3.00E-04	1.92E-04	1.71E-04	1.42E-04
450	2.60E-04	1.90E-04	1.72E-04	1.22E-04
480	2.77E-04	1.69E-04	1.95E-04	1.19E-04
510	2.64E-04	1.67E-04	2.05E-04	1.26E-04
540	2.04E-04	1.74E-04	2.02E-04	1.25E-04
570	2.12E-04	1.81E-04	2.10E-04	1.24E-04
600	2.25E-04	1.80E-04	2.14E-04	1.30E-04
630	2.53E-04	1.81E-04	2.15E-04	1.25E-04
660	2.03E-04	1.87E-04	2.18E-04	1.25E-04
690	2.14E-04	1.87E-04	1.94E-04	1.34E-04
720	2.31E-04	1.87E-04	1.82E-04	1.46E-04
750	2.54E-04	1.87E-04	1.66E-04	1.42E-04
780	1.87E-04	1.67E-04	1.95E-04	1.43E-04
810	1.72E-04	1.26E-04	1.63E-04	1.49E-04
840	1.73E-04	1.29E-04	1.18E-04	1.36E-04
870	1.81E-04	1.55E-04	1.18E-04	1.38E-04
900	1.78E-04	1.40E-04	1.54E-04	1.45E-04
930	1.76E-04	1.17E-04	1.93E-04	1.53E-04
960	1.79E-04	1.26E-04	1.86E-04	1.58E-04
990	1.80E-04	1.48E-04	1.22E-04	1.66E-04
1020	1.70E-04	1.74E-04	1.02E-04	1.72E-04
1050	1.64E-04	1.76E-04	8.19E-05	1.78E-04
1080	1.31E-04	1.23E-04	5.63E-05	1.62E-04
1110	1.10E-04	8.09E-05	4.90E-05	1.71E-04
1140	1.07E-04	1.30E-04	4.89E-05	1.60E-04
1170	1.01E-04	1.68E-04	4.86E-05	1.55E-04
1200	1.01E-04	1.79E-04	4.47E-05	1.63E-04
1230	9.06E-05	1.70E-04	4.26E-05	1.72E-04
1260	7.53E-05	9.58E-05	4.51E-05	2.05E-04
1290	6.51E-05	6.26E-05	4.46E-05	2.02E-04
1320	5.78E-05	4.45E-05	3.28E-05	2.05E-04
1350	5.68E-05	4.07E-05	2.60E-05	2.06E-04
1380	5.71E-05	4.02E-05	2.12E-05	1.96E-04
1410	5.58E-05	3.90E-05	2.12E-05	1.60E-04
1440	5.38E-05	3.89E-05	1.99E-05	1.33E-04
1470	5.78E-05	3.79E-05	1.89E-05	4.61E-05
1500	5.79E-05	3.65E-05	1.82E-05	1.79E-05

FLIGHT NO. C-466
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5195 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-466 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
	FILTERS 2	4	3	5
1530	6.77E-05	3.72E-05	1.85E-05	1.84E-05
1560	7.56E-05	3.69E-05	1.91E-05	1.97E-05
1590	7.36E-05	3.63E-05	1.97E-05	1.86E-05
1620	7.09E-05	3.59E-05	1.99E-05	1.90E-05
1650	6.90E-05	3.54E-05	2.08E-05	1.80E-05
1680	6.76E-05	3.54E-05	2.16E-05	2.35E-05
1710	6.51E-05	3.52E-05	2.23E-05	4.34E-05
1740	5.62E-05	3.52E-05	2.21E-05	4.80E-05
1770	5.58E-05	3.53E-05	2.18E-05	2.54E-05
1800	5.60E-05	3.54E-05	2.19E-05	1.79E-05
1930	5.66E-05	3.56E-05	2.21E-05	1.75E-05
1860	5.64E-05	3.49E-05	2.23E-05	1.81E-05
1890	5.68E-05	3.43E-05	2.11E-05	1.77E-05
1920	5.63E-05	3.43E-05	1.98E-05	1.69E-05
1950	5.64E-05	3.54E-05	1.89E-05	1.61E-05
1980	5.60E-05	3.64E-05	1.90E-05	1.68E-05
2010	5.66E-05	3.60E-05	1.86E-05	1.68E-05
2040	5.63E-05	3.56E-05	1.88E-05	1.71E-05
2070	5.64E-05	3.59E-05	1.88E-05	1.72E-05
2100	5.67E-05	4.02E-05	1.90E-05	1.82E-05
2130	5.66E-05	4.39E-05	1.87E-05	1.96E-05
2160	5.50E-05	4.76E-05	1.86E-05	1.86E-05
2190	5.41E-05	5.00E-05	1.88E-05	1.82E-05
2220	5.39E-05	5.03E-05	1.84E-05	1.91E-05
2250	5.20E-05	4.99E-05	1.93E-05	2.01E-05
2280	5.28E-05	4.87E-05	2.32E-05	2.03E-05
2310	5.61E-05	3.97E-05	2.62E-05	2.20E-05
2340	5.97E-05	3.63E-05	2.67E-05	2.10E-05
2370	6.07E-05	3.62E-05	2.76E-05	2.07E-05
2400	6.20E-05	3.62E-05	2.97E-	2.18E-05
2430	6.11E-05	3.60E-05	3.05E-	2.06E-05
2460	6.23E-05	3.59E-05	3.12E-05	2.12E-05
2490	6.54E-05	3.58E-05	3.14E-05	2.09E-05
2520	6.91E-05	3.61E-05	3.10E-05	2.12E-05
2550	6.42E-05	3.61E-05	2.83E-05	1.82E-05
2580	6.41E-05	3.60E-05	2.59E-05	1.73E-05
2610	6.43E-05	3.59E-05	2.56E-05	1.68E-05
2640	6.30E-05	3.76E-05	2.48E-05	1.75E-05
2670	5.53E-05	3.90E-05	2.21E-05	1.80E-05
2700	5.12E-05	3.85E-05	1.94E-05	1.79E-05
2730	5.20E-05	3.69E-05	1.82E-05	1.65E-05
2760	5.26E-05	3.63E-05	1.89E-05	1.71E-05
2790	5.29E-05	3.68E-05	2.03E-05	1.88E-05
2820	5.31E-05	3.68E-05	2.09E-05	1.72E-05
2850	5.34E-05	3.70E-05	2.08E-05	1.71E-05
2880	5.25E-05	3.72E-05	2.07E-05	1.73E-05
2910	5.27E-05	3.65E-05	2.04E-05	1.67E-05
2940	5.26E-05	3.58E-05	2.00E-05	1.68E-05
2970	5.25E-05	3.51E-05	2.04E-05	1.69E-05
3000	5.35E-05	3.49E-05	1.98E-05	1.70E-05

FLIGHT NO. C-466
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5195 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-466 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.19E-05	3.40E-05	1.95E-05	1.71E-05
3060	5.05E-05	3.39E-05	1.88E-05	1.72E-05
3090	5.11E-05	3.38E-05	1.86E-05	1.73E-05
3120	5.21E-05	3.35E-05	1.79E-05	1.74E-05
3150	5.21E-05	3.35E-05	1.82E-05	1.75E-05
3180	5.22E-05	3.37E-05	1.80E-05	1.76E-05
3210	5.22E-05	3.37E-05	1.72E-05	1.77E-05
3240	5.16E-05	3.24E-05	1.87E-05	1.78E-05
3270	5.12E-05	3.19E-05	1.86E-05	1.79E-05
3300	5.10E-05	3.10E-05	1.85E-05	1.80E-05
3330	5.07E-05	3.07E-05	1.83E-05	1.86E-05
3360	5.09E-05	3.07E-05	1.82E-05	1.93E-05
3390	5.04E-05	3.14E-05	1.81E-05	1.95E-05
3420	5.02E-05	3.24E-05	1.80E-05	1.89E-05
3450	4.96E-05	3.39E-05	1.79E-05	1.97E-05
3480	4.88E-05	3.37E-05	1.78E-05	1.98E-05
3510	4.64E-05	3.43E-05	1.77E-05	2.02E-05
3540	4.48E-05	3.73E-05	1.75E-05	1.85E-05
3570	4.51E-05	3.99E-05	1.74E-05	1.88E-05
3600	4.49E-05	3.96E-05	1.73E-05	2.08E-05
3630	4.52E-05	5.25E-05	1.72E-05	2.09E-05
3660	4.68E-05	7.29E-05	1.71E-05	1.86E-05
3690	4.50E-05	5.76E-05	1.70E-05	1.71E-05
3720	4.55E-05	3.39E-05	1.69E-05	1.71E-05
3750	4.56E-05	3.18E-05	1.67E-05	1.60E-05
3780	4.57E-05	3.29E-05	1.66E-05	1.58E-05
3810	4.58E-05	3.26E-05	1.65E-05	1.61E-05
3840	4.59E-05	3.23E-05	1.63E-05	1.55E-05
3870	4.60E-05	3.19E-05	1.66E-05	1.60E-05
3900	4.60E-05	3.16E-05	1.68E-05	1.60E-05
3930	4.61E-05	3.13E-05	1.66E-05	1.59E-05
3960	4.62E-05	3.09E-05	1.66E-05	1.61E-05
3990	4.63E-05	3.06E-05	1.66E-05	1.61E-05
4020	4.64E-05	3.03E-05	1.65E-05	1.61E-05
4050	4.65E-05	2.99E-05	1.66E-05	1.65E-05
4080	4.66E-05	3.01E-05	1.66E-05	1.57E-05
4110	4.67E-05	3.01E-05	1.65E-05	1.53E-05
4140	4.66E-05	3.00E-05	1.65E-05	1.59E-05
4170	4.65E-05	2.97E-05	1.67E-05	1.61E-05
4200	4.62E-05	2.98E-05	1.66E-05	1.58E-05
4230	4.56E-05	2.92E-05	1.66E-05	1.65E-05
4260	4.52E-05	2.90E-05	1.68E-05	1.51E-05
4290	4.54E-05	2.92E-05	1.63E-05	1.58E-05
4320	4.56E-05	2.94E-05	1.65E-05	1.64E-05
4350	4.52E-05	2.94E-05	1.64E-05	1.59E-05
4380	4.49E-05	2.91E-05	1.61E-05	1.57E-05
4410	4.53E-05	2.89E-05	1.59E-05	1.57E-05
4440	4.48E-05	2.90E-05	1.62E-05	1.62E-05
4470	4.45E-05	2.92E-05	1.62E-05	1.61E-05
4500	4.42E-05	2.90E-05	1.63E-05	1.58E-05

FLIGHT NO. C-466
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5195 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-466 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.42E-05	2.89E-05	1.69E-05	1.64E-05
4560	4.41E-05	2.88E-05	1.72E-05	1.61E-05
4590	4.41E-05	2.87E-05	1.65E-05	1.59E-05
4620	4.45E-05	2.87E-05	1.68E-05	1.52E-05
4650	4.53E-05	2.88E-05	1.66E-05	1.53E-05
4680	4.69E-05	2.87E-05	1.65E-05	1.52E-05
4710	4.66E-05	2.86E-05	1.65E-05	1.57E-05
4740	4.68E-05	2.85E-05	1.67E-05	1.59E-05
4770	4.53E-05	2.84E-05	1.74E-05	1.53E-05
4800	4.58E-05	2.92E-05	1.73E-05	1.64E-05
4830	4.61E-05	2.94E-05	1.69E-05	1.63E-05
4860	4.58E-05	2.95E-05	1.70E-05	1.56E-05
4890	4.58E-05	2.97E-05	1.69E-05	1.59E-05
4920	4.59E-05	2.99E-05	1.68E-05	1.55E-05
4950	4.62E-05	3.01E-05	1.70E-05	1.51E-05
4980	4.69E-05	3.03E-05	1.71E-05	1.51E-05
5010	4.67E-05	3.04E-05	1.72E-05	1.57E-05
5040	4.67E-05	3.06E-05	1.71E-05	1.59E-05
5070	4.65E-05	3.08E-05	1.75E-05	1.55E-05
5100	4.68E-05	3.00E-05	1.77E-05	1.57E-05
5130	4.63E-05	2.95E-05	1.77E-05	1.56E-05
5160	4.68E-05	2.90E-05	1.78E-05	1.65E-05
5190	4.69E-05	2.87E-05	1.78E-05	1.58E-05
5220	4.65E-05	2.89E-05	1.74E-05	1.60E-05
5250	4.66E-05	2.87E-05	1.77E-05	1.58E-05
5280	4.58E-05	2.90E-05	1.83E-05	1.57E-05
5310	4.59E-05	2.89E-05	1.78E-05	1.59E-05
5340	4.48E-05	3.00E-05	1.75E-05	1.61E-05
5370	4.47E-05	3.02E-05	1.67E-05	1.66E-05
5400	4.46E-05	3.07E-05	1.68E-05	1.54E-05
5430	4.45E-05	3.08E-05	1.78E-05	1.62E-05
5460	4.44E-05	2.98E-05	1.83E-05	1.68E-05
5490	4.43E-05	2.91E-05	1.85E-05	1.62E-05
5520	4.42E-05	2.93E-05	1.84E-05	1.63E-05
5550	4.41E-05	2.90E-05	1.81E-05	1.81E-05
5580	4.39E-05	2.86E-05	1.78E-05	1.61E-05
5610	4.44E-05	2.86E-05	1.79E-05	1.74E-05
5640	4.47E-05	2.84E-05	1.73E-05	1.58E-05
5670	4.68E-05	2.84E-05	1.80E-05	1.71E-05
5700	4.67E-05	2.83E-05	1.74E-05	1.69E-05
5730	4.67E-05	2.82E-05	1.76E-05	2.37E-05
5760	4.78E-05	2.82E-05	1.73E-05	2.27E-05
5790	4.59E-05	2.82E-05	1.75E-05	2.46E-05
5820	4.66E-05	2.82E-05	1.77E-05	2.44E-05
5850	4.75E-05	2.81E-05	1.79E-05	2.42E-05
5880	4.64E-05	2.83E-05	1.78E-05	2.52E-05
5910	4.58E-05	2.85E-05	1.80E-05	2.57E-05
5940	(4.57E-05)	(2.84E-05)	1.78E-05	(2.56E-05)
5970	(4.56E-05)	(2.83E-05)	1.77E-05	(2.55E-05)
6000	(4.54E-05)	(2.82E-05)	1.79E-05	(2.54E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	5910	5910	6000	5910

FLIGHT NO. C-466
EQUIVALENT ATTENUATION LENGTH

(JOB 5195 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-466 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	3.44E 03	4.83E 03	7.35E 03	1.51E 04
300	3.37E 03	5.48E 03	7.12E 03	8.57E 03
600	3.56E 03	5.47E 03	5.21E 03	8.14E 03
900	3.90E 03	5.63E 03	6.03E 03	7.83E 03
1200	4.38E 03	5.94E 03	5.70E 03	7.33E 03
1500	5.11E 03	6.75E 03	7.97E 03	7.08E 03
1800	5.74E 03	7.73E 03	9.26E 03	8.20E 03
2100	6.36E 03	8.62E 03	1.05E 04	9.35E 03
2400	6.91E 03	9.34E 03	1.15E 04	1.04E 04
2700	7.38E 03	1.01E 04	1.25E 04	1.14E 04
3000	7.86E 03	1.08E 04	1.36E 04	1.24E 04
3300	8.31E 03	1.14E 04	1.45E 04	1.34E 04
3600	8.74E 03	1.20E 04	1.55E 04	1.43E 04
3900	9.16E 03	1.25E 04	1.64E 04	1.51E 04
4200	9.56E 03	1.31E 04	1.73E 04	1.60E 04
4500	9.93E 03	1.37E 04	1.82E 04	1.68E 04
4800	1.03E 04	1.42E 04	1.90E 04	1.76E 04
5100	1.06E 04	1.47E 04	1.98E 04	1.84E 04
5400	1.09E 04	1.52E 04	2.06E 04	1.92E 04
5700	1.12E 04	1.56E 04	2.13E 04	1.99E 04
6000	1.15E 04	1.61E 04	2.20E 04	2.04E 04

FLIGHT NO. C-466
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.15E-01	9.47E-01	9.59E-01	9.66E-01
600	8.45E-01	8.96E-01	9.08E-01	9.29E-01
900	7.94E-01	8.52E-01	8.61E-01	8.91E-01
1200	7.60E-01	8.17E-01	8.36E-01	8.49E-01
1500	7.45E-01	8.01E-01	8.28E-01	8.09E-01
1800	7.31E-01	7.92E-01	8.23E-01	8.03E-01
2100	7.19E-01	7.84E-01	8.18E-01	7.99E-01
2400	7.07E-01	7.73E-01	8.13E-01	7.94E-01
2700	6.94E-01	7.65E-01	8.05E-01	7.89E-01
3000	6.83E-01	7.57E-01	8.01E-01	7.85E-01
3300	6.72E-01	7.49E-01	7.97E-01	7.81E-01
3600	6.62E-01	7.42E-01	7.93E-01	7.77E-01
3900	6.53E-01	7.32E-01	7.89E-01	7.73E-01
4200	6.44E-01	7.26E-01	7.85E-01	7.69E-01
4500	6.36E-01	7.19E-01	7.81E-01	7.65E-01
4800	6.27E-01	7.13E-01	7.77E-01	7.62E-01
5100	6.18E-01	7.07E-01	7.73E-01	7.58E-01
5400	6.10E-01	7.01E-01	7.69E-01	7.55E-01
5700	6.02E-01	6.95E-01	7.65E-01	7.51E-01
6000	5.94E-01	6.89E-01	7.61E-01	7.45E-01

FLIGHT C-467 - 18 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1116	1257	1.68	39.1	-	41.8	120	4710
4,5	1302	1435	1.55	42.1	-	52.2	90	4710

Flight Description. Flight C-467 was an afternoon flight with take off at 1027 and landing at 1528 GMT. There were scattered cumulus and scattered cirrus clouds with total cloud coverage over the track less than half the sky at all times and levels. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted at 1120 GMT at 300 meters (1000 feet) that there were scattered cumulus at 750 meters (2500 feet), scattered cirrus at 9000 meters (30,000 feet) and a slant range of more than 24 kilometers (15 miles). At 1135 GMT at 750 meters (2500 feet) slant range had decreased to 16 kilometers (10 miles) and there were cumulus forming at the top of the planetary boundary layer (PBL) about 2/8 coverage; haze is densest in top 300 meters (1000 feet) of PBL. Scattered cirrus is very high with only occasional heavy patch. Shadows from clouds are distinct but blend with darker greens of landscape. At 1200 GMT on the climb to 2100 meters (7000 feet) off the track scattered cumulus were becoming more dense and building with cloud bases close to 1200 meters (4000 feet) and top of haze at 1350 meters (4500 feet). At 1215 GMT at 2100 meters (7000 feet) scattered clouds with bases at 1050 meters (3500 feet) and tops at 1500 meters (5000 feet), scattered cirrus at 9000 meters (30,000 feet) slant range 32 kilometers (20 miles) in light haze. At 1220 GMT on the climb to 4500 meters (15,000 feet) it was generally clear with very light haze layers visible but indistinct. At 4500 meters (15,000 feet) the slant range was 64 kilometers (40 miles) in light haze. At 1425 GMT at 1050 meters (3500 feet) near the cloud bases - at any one time a quadrant can differ greatly from the mean if a cloud is present there - no average smearing is possible as scanner looks at discrete clouds. On the climb to 2700 meters (9000 feet) cloud bases were at 1200 meters (4000 feet) with haze top 1350 meters (4500 feet) and clear above. At 2700 meters (9000 feet) the cumulus were flattening out and being suppressed. Toward the sun the haze top is bright and blends with the cumulus. Down sun the haze is dark and the clouds are bright. Deck has been thinning but as spreadout continues to the west the area of coverage is much greater. At 4500 meters (15,000 feet) the cumulus continued to decrease and were now about 1/8 in coverage and low level haze sharply stopped. On the last descent the clouds tops were 1800 meters (6000 feet), haze tops 1650 meters (5500 feet) with cloud debris from 1650 to 1440 meters (5500 to 4800 feet). Uniform haze was below and visibility decreased within the haze layer.

Local Weather Notes. DeBilt, 32.1 kilometers northwest of the track center, reported 3/8 to 6/8 cumulus and some stratocumulus at 750 to 900 meters (2500 to 3000 feet) with visibilities 20 to 25 kilometers.

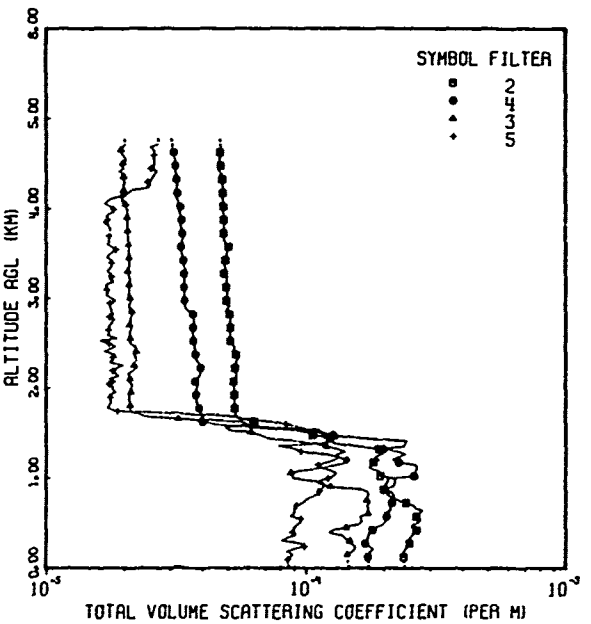
Soesterberg, 30.3 kilometers northwest of the track center, recorded 1/8 to 2/8 cumulus at 750 meters (2500 feet) and 2/8 to 3/8 thin cirrus with 25 kilometers visibility up to 1200 GMT. In the afternoon there were 3/8 to 4/8 cumulus at 1050 meters (3500 feet) with visibility 20 to 25 kilometers.

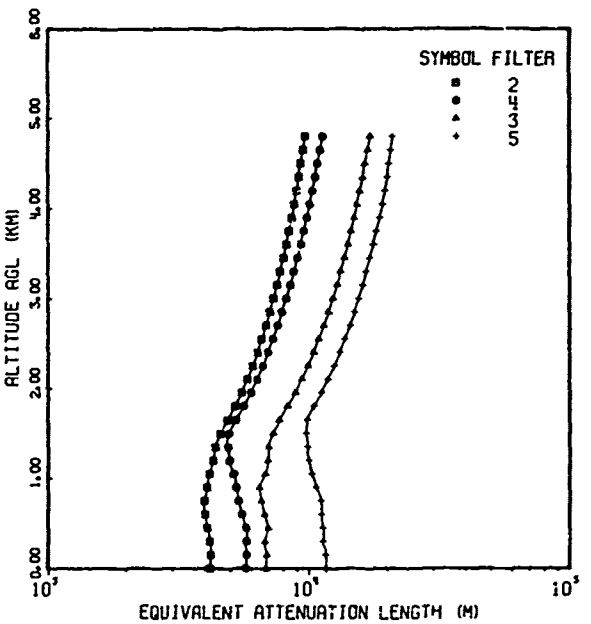
Deelen, 26.3 kilometers northeast of the track center, reported 2/8 to 3/8 cumulus at heights varying from 750 to 1500 meters (2500 to 5000 feet) and 3/8 to 5/8 high cirrus with visibility of 25 kilometers.

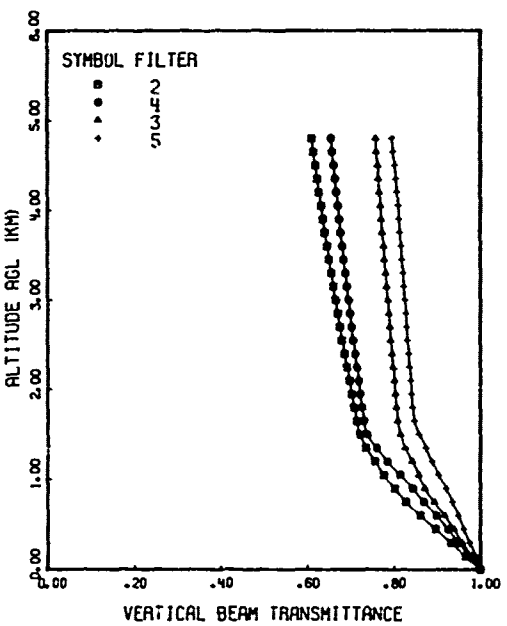
The radiosonde station at DeBilt was 32.1 kilometers northwest and upstream from the track. The 1200 raob is colder above 500 millibars than the sounding at 0000 GMT.

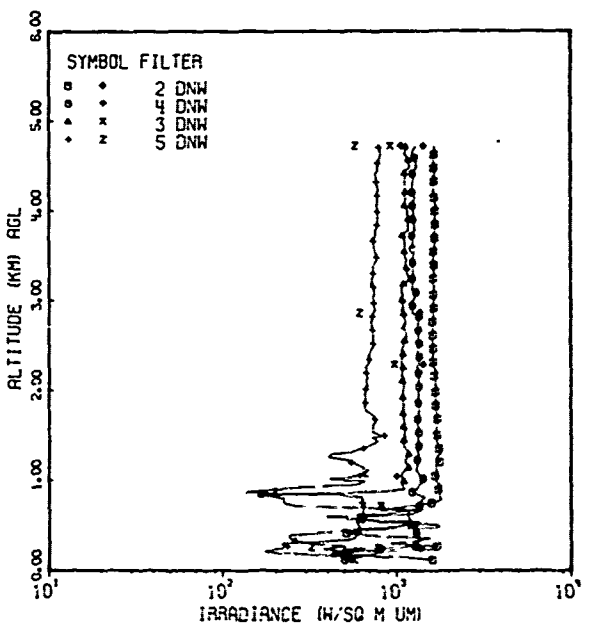
Synoptic Remarks. The surface chart for 0000 GMT had a high centered near Paris. There was an occluded front 5° west of the Irish coast. The track was in the northeast quadrant of the high with northeasterly surface flow. At 1200 GMT a small 1025 millibar high was centered near Düsseldorf with the track west of the center in light and variable surface flow. An occluded front was approaching the west coast of Ireland with the cold front part of the system extending southsouthwest into the eastern Atlantic. The 500 millibar chart for 0000 GMT had a trough from Sweden southward to Sicily. There was a ridge from France to the Shetland Islands. The track was between these two systems with strong (50 knots) northwesterly flow. At 1200 GMT there was little change except the gradient had weakened to moderate northwesterly flow over the track. The air mass was maritime polar. The satellite map for 1309 GMT showed thin clouds over western Europe and heavier cloud cover over eastern Europe.

FLIGHT NO. C-467
SOESTERBERG









FLIGHT NO. C-467
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5194 DATE 05/16/80)
DATE 81878 FLIGHT NO. C-467 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.40E-04)	(1.75E-04)	(1.46E-04)	(8.59E-05)
30	(2.39E-04)	(1.74E-04)	(1.45E-04)	(8.54E-05)
60	(2.38E-04)	(1.74E-04)	(1.45E-04)	(8.52E-05)
90	(2.38E-04)	(1.73E-04)	(1.45E-04)	8.50E-05
120	2.37E-04	1.73E-04	(1.44E-04)	8.70E-05
150	2.38E-04	1.77E-04	1.44E-04	8.87E-05
180	2.36E-04	1.75E-04	1.51E-04	8.41E-05
210	2.42E-04	1.81E-04	1.54E-04	8.97E-05
240	2.43E-04	1.75E-04	1.54E-04	9.85E-05
270	2.49E-04	1.68E-04	1.48E-04	9.53E-05
300	2.51E-04	1.69E-04	1.46E-04	8.05E-05
330	2.49E-04	1.72E-04	1.41E-04	8.46E-05
360	2.56E-04	1.73E-04	1.38E-04	9.11E-05
390	2.58E-04	1.74E-04	1.23E-04	8.83E-05
420	2.65E-04	1.79E-04	1.26E-04	8.91E-05
450	2.56E-04	1.86E-04	1.42E-04	9.06E-05
480	2.58E-04	1.96E-04	1.58E-04	9.31E-05
510	2.72E-04	2.02E-04	1.64E-04	9.58E-05
540	2.74E-04	2.06E-04	1.62E-04	9.56E-05
570	2.65E-04	2.04E-04	1.62E-04	8.71E-05
600	2.71E-04	2.01E-04	1.73E-04	9.01E-05
630	2.81E-04	2.11E-04	1.73E-04	9.00E-05
660	2.63E-04	2.12E-04	1.73E-04	8.99E-05
690	2.59E-04	2.11E-04	1.71E-04	9.19E-05
720	2.42E-04	2.13E-04	1.75E-04	9.76E-05
750	2.25E-04	2.15E-04	1.71E-04	9.94E-05
780	2.15E-04	2.14E-04	1.71E-04	1.04E-04
810	2.16E-04	2.05E-04	1.73E-04	1.11E-04
840	2.12E-04	2.10E-04	1.72E-04	1.12E-04
870	1.99E-04	2.01E-04	1.64E-04	1.15E-04
900	2.16E-04	1.97E-04	1.24E-04	1.18E-04
930	2.20E-04	2.05E-04	1.13E-04	1.17E-04
960	2.19E-04	2.07E-04	1.09E-04	1.12E-04
990	2.20E-04	2.06E-04	8.91E-05	1.21E-04
1020	1.93E-04	2.59E-04	8.81E-05	1.27E-04
1050	1.95E-04	2.62E-04	8.71E-05	1.31E-04
1080	1.89E-04	2.64E-04	9.70E-05	1.24E-04
1110	1.75E-04	2.66E-04	1.15E-04	1.15E-04
1140	1.77E-04	2.64E-04	1.29E-04	1.11E-04
1170	1.81E-04	2.26E-04	1.45E-04	1.20E-04
1200	1.90E-04	2.15E-04	1.43E-04	1.28E-04
1230	1.84E-04	2.26E-04	1.33E-04	1.34E-04
1260	1.92E-04	2.40E-04	1.30E-04	1.20E-04
1290	2.03E-04	2.26E-04	1.41E-04	9.47E-05
1320	1.90E-04	1.97E-04	1.32E-04	9.05E-05
1350	1.59E-04	2.37E-04	1.19E-04	7.83E-05
1380	1.30E-04	2.40E-04	1.09E-04	1.14E-04
1410	1.23E-04	2.43E-04	8.59E-05	1.27E-04
1440	1.32E-04	1.66E-04	7.11E-05	1.21E-04
1470	1.06E-04	1.27E-04	5.71E-05	1.21E-04
1500	1.04E-04	1.15E-04	5.12E-05	1.12E-04

FLIGHT NO. C-467
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5194 DATE 05/16/80)
DATE 81878 FLIGHT NO. C-467 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	8.70E-05	1.11E-04	5.06E-05	1.03E-04
1560	5.88E-05	7.01E-05	4.88E-05	9.31E-05
1590	6.09E-05	4.46E-05	5.91E-05	8.34E-05
1620	6.31E-05	3.99E-05	5.64E-05	7.36E-05
1650	5.57E-05	3.91E-05	3.23E-05	5.72E-05
1680	5.35E-05	4.02E-05	2.43E-05	5.42E-05
1710	5.34E-05	3.93E-05	2.25E-05	3.20E-05
1740	5.30E-05	3.93E-05	2.10E-05	1.87E-05
1770	5.31E-05	3.88E-05	2.11E-05	1.72E-05
1800	5.26E-05	3.83E-05	2.11E-05	1.75E-05
1830	5.29E-05	3.79E-05	2.11E-05	1.78E-05
1860	5.28E-05	3.77E-05	2.08E-05	1.76E-05
1890	5.29E-05	3.77E-05	2.08E-05	1.77E-05
1920	5.27E-05	3.76E-05	2.08E-05	1.75E-05
1950	5.27E-05	3.80E-05	2.12E-05	1.84E-05
1980	5.28E-05	3.77E-05	2.13E-05	1.80E-05
2010	5.29E-05	3.81E-05	2.14E-05	1.81E-05
2040	5.30E-05	3.86E-05	2.14E-05	1.75E-05
2070	5.26E-05	3.75E-05	2.09E-05	1.85E-05
2100	5.37E-05	3.81E-05	2.11E-05	1.75E-05
2130	5.39E-05	3.91E-05	2.10E-05	1.90E-05
2160	5.39E-05	3.94E-05	2.07E-05	1.85E-05
2190	5.31E-05	3.94E-05	2.15E-05	1.80E-05
2220	5.32E-05	3.93E-05	2.24E-05	1.86E-05
2250	5.34E-05	3.92E-05	2.18E-05	1.97E-05
2280	5.35E-05	3.84E-05	2.22E-05	1.76E-05
2310	5.40E-05	3.77E-05	2.22E-05	1.79E-05
2340	5.52E-05	3.75E-05	2.21E-05	1.80E-05
2370	5.36E-05	3.75E-05	2.18E-05	1.83E-05
2400	5.31E-05	3.75E-05	2.22E-05	1.68E-05
2430	5.30E-05	3.75E-05	2.24E-05	1.76E-05
2460	5.28E-05	3.71E-05	2.20E-05	1.85E-05
2490	5.20E-05	3.69E-05	2.12E-05	1.74E-05
2520	5.11E-05	3.69E-05	2.09E-05	1.62E-05
2550	5.11E-05	3.69E-05	2.11E-05	1.87E-05
2580	5.10E-05	3.68E-05	2.09E-05	1.73E-05
2610	5.09E-05	3.66E-05	2.09E-05	1.75E-05
2640	5.10E-05	3.68E-05	2.11E-05	1.73E-05
2670	5.11E-05	3.67E-05	2.13E-05	1.74E-05
2700	5.10E-05	3.69E-05	2.09E-05	1.76E-05
2730	5.08E-05	3.70E-05	2.12E-05	1.79E-05
2760	5.09E-05	3.69E-05	2.10E-05	1.82E-05
2790	5.08E-05	3.67E-05	2.12E-05	1.75E-05
2820	5.06E-05	3.66E-05	2.14E-05	1.80E-05
2850	5.04E-05	3.56E-05	2.13E-05	1.77E-05
2880	4.96E-05	3.45E-05	2.10E-05	1.78E-05
2910	5.10E-05	3.42E-05	2.09E-05	1.75E-05
2940	4.86E-05	3.41E-05	2.09E-05	1.76E-05
2970	4.94E-05	3.41E-05	2.12E-05	1.85E-05
3000	4.93E-05	3.40E-05	2.10E-05	1.77E-05

FLIGHT NO. C-467
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5194 DATE 05/16/80)
DATE 81878 FLIGHT NO. C-467 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.94E-05	3.40E-05	2.07E-05	1.70E-05
3060	4.97E-05	3.40E-05	2.08E-05	1.73E-05
3090	4.93E-05	3.40E-05	2.09E-05	1.71E-05
3120	4.92E-05	3.39E-05	2.08E-05	1.70E-05
3150	4.91E-05	3.39E-05	2.08E-05	1.70E-05
3180	4.93E-05	3.39E-05	2.10E-05	1.81E-05
3210	4.92E-05	3.39E-05	2.09E-05	1.75E-05
3240	4.91E-05	3.39E-05	2.08E-05	1.78E-05
3270	4.83E-05	3.40E-05	2.08E-05	1.76E-05
3300	4.88E-05	3.46E-05	2.06E-05	1.72E-05
3330	4.90E-05	3.42E-05	2.08E-05	1.76E-05
3360	4.85E-05	3.39E-05	2.09E-05	1.79E-05
3390	4.87E-05	3.38E-05	2.09E-05	1.78E-05
3420	4.89E-05	3.38E-05	2.09E-05	1.78E-05
3450	4.94E-05	3.36E-05	2.08E-05	1.71E-05
3480	4.92E-05	3.33E-05	2.08E-05	1.75E-05
3510	4.96E-05	3.31E-05	2.08E-05	1.80E-05
3540	5.03E-05	3.30E-05	2.08E-05	1.85E-05
3570	5.02E-05	3.30E-05	2.07E-05	1.78E-05
3600	4.90E-05	3.30E-05	2.07E-05	1.71E-05
3630	4.86E-05	3.35E-05	2.07E-05	1.75E-05
3660	4.83E-05	3.39E-05	2.07E-05	1.75E-05
3690	4.84E-05	3.37E-05	2.06E-05	1.75E-05
3720	4.82E-05	3.35E-05	2.06E-05	1.76E-05
3750	4.86E-05	3.37E-05	2.06E-05	1.76E-05
3780	4.83E-05	3.32E-05	2.06E-05	1.76E-05
3810	4.82E-05	3.29E-05	2.05E-05	1.73E-05
3840	4.87E-05	3.31E-05	2.05E-05	1.69E-05
3870	4.81E-05	3.33E-05	2.05E-05	1.76E-05
3900	4.82E-05	3.30E-05	2.05E-05	1.70E-05
3930	4.82E-05	3.29E-05	2.04E-05	1.73E-05
3960	4.78E-05	3.26E-05	2.04E-05	1.80E-05
3990	4.79E-05	3.27E-05	2.04E-05	1.81E-05
4020	4.79E-05	3.28E-05	2.02E-05	1.76E-05
4050	4.81E-05	3.26E-05	2.01E-05	1.68E-05
4080	4.80E-05	3.22E-05	1.97E-05	1.73E-05
4110	4.78E-05	3.18E-05	1.96E-05	1.78E-05
4140	4.78E-05	3.18E-05	1.99E-05	1.96E-05
4170	4.79E-05	3.20E-05	2.00E-05	2.06E-05
4200	4.81E-05	3.17E-05	1.99E-05	2.13E-05
4230	4.79E-05	3.18E-05	1.98E-05	2.46E-05
4260	4.76E-05	3.20E-05	1.98E-05	2.51E-05
4290	4.78E-05	3.17E-05	2.00E-05	2.46E-05
4320	4.76E-05	3.17E-05	1.98E-05	2.54E-05
4350	4.72E-05	3.16E-05	1.98E-05	2.57E-05
4380	4.71E-05	3.16E-05	1.98E-05	2.61E-05
4410	4.65E-05	3.16E-05	1.91E-05	2.57E-05
4440	4.69E-05	3.15E-05	2.00E-05	2.54E-05
4470	4.71E-05	3.15E-05	1.96E-05	2.61E-05
4500	4.72E-05	3.17E-05	1.98E-05	2.61E-05

FLIGHT NO. C-467
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5194 DATE 05/16/80)
DATE 81878 FLIGHT NO. C-467 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.65E-05	3.14E-05	2.03E-05	2.60E-05
4560	4.67E-05	3.12E-05	2.02E-05	2.58E-05
4590	4.71E-05	3.10E-05	1.98E-05	2.61E-05
4620	4.67E-05	3.10E-05	1.94E-05	2.60E-05
4650	4.71E-05	3.07E-05	1.94E-05	2.59E-05
4680	(4.69E-05)	(3.06E-05)	1.98E-05	2.51E-05
4710	(4.68E-05)	(3.05E-05)	2.01E-05	2.70E-05
4740	(4.66E-05)	(3.04E-05)	(2.01E-05)	(2.69E-05)
4770	(4.65E-05)	(3.03E-05)	(2.00E-05)	(2.68E-05)
4800	(4.64E-05)	(3.02E-05)	(1.99E-05)	(2.67E-05)
FIRST DATA ALT	120	120	150	90
LAST DATA ALT	4650	4650	4710	4710

FLIGHT NO. C-467
EQUIVALENT ATTENUATION LENGTH

(JOB 5194 DATE 05/16/80)
DATE 81878 FLIGHT NO. C-467 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	4.17E 03	5.72E 03	6.84E 03	1.16E 04
300	4.16E 03	5.74E 03	6.77E 03	1.13E 04
600	3.99E 03	5.52E 03	6.78E 03	1.12E 04
900	4.07E 03	5.25E 03	6.46E 03	1.07E 04
1200	4.28E 03	4.95E 03	6.96E 03	1.00E 04
1500	4.58E 03	4.93E 03	7.31E 03	9.77E 03
1800	5.20E 03	5.62E 03	8.32E 03	1.05E 04
2100	5.81E 03	6.33E 03	9.43E 03	1.19E 04
2400	6.35E 03	6.99E 03	1.05E 04	1.32E 04
2700	6.86E 03	7.62E 03	1.15E 04	1.44E 04
3000	7.35E 03	8.22E 03	1.24E 04	1.56E 04
3300	7.80E 03	8.79E 03	1.33E 04	1.67E 04
3600	8.22E 03	9.34E 03	1.41E 04	1.77E 04
3900	8.62E 03	9.86E 03	1.50E 04	1.87E 04
4200	9.00E 03	1.04E 04	1.57E 04	1.96E 04
4500	9.36E 03	1.09E 04	1.65E 04	2.03E 04
4800	9.70E 03	1.13E 04	1.72E 04	2.09E 04

FLIGHT NO. C-467
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.30E-01	9.49E-01	9.57E-01	9.74E-01
600	8.60E-01	8.97E-01	9.15E-01	9.48E-01
900	8.02E-01	8.43E-01	8.70E-01	9.20E-01
1200	7.55E-01	7.85E-01	8.42E-01	8.87E-01
1500	7.21E-01	7.38E-01	8.15E-01	8.58E-01
1800	7.08E-01	7.26E-01	8.05E-01	8.42E-01
2100	6.96E-01	7.18E-01	8.00E-01	8.38E-01
2400	6.85E-01	7.09E-01	7.95E-01	8.33E-01
2700	6.75E-01	7.02E-01	7.90E-01	8.29E-01
3000	6.65E-01	6.94E-01	7.85E-01	8.25E-01
3300	6.55E-01	6.87E-01	7.80E-01	8.20E-01
3600	6.45E-01	6.80E-01	7.75E-01	8.16E-01
3900	6.36E-01	6.73E-01	7.71E-01	8.12E-01
4200	6.27E-01	6.67E-01	7.66E-01	8.07E-01
4500	6.18E-01	6.61E-01	7.61E-01	8.01E-01
4800	6.10E-01	6.55E-01	7.57E-01	7.95E-01

FLIGHT C-468 - 21 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0920	1058	1.63	48.6	-	41.4	120	5820
4,5	1102	1244	1.70	41.3	40.9	43.3	120	6210

Flight Description. Flight C-468 was a midday flight spanning local apparent noon with take off at 0847 and landing at 1320 GMT. There were scattered high thin cirrus clouds. The approximate northeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns.

In-Flight Notes. The in-flight observer noted that there was very muted horizontal banding in haze and cirrus above - gradual clearing of haze left relatively clear cirrus layers against blue sky. A weak frontal passage last night has left cirrus. A new frontal system to the northwest is causing more cirrus to move in from the northwest slowly. At 0920 GMT at 300 meters (1000 feet) there was scattered cirrus at 6000 meters (20,000 feet) with 8 kilometers (5 miles) slant range down sun. On the climb from 1350 to 3000 meters (4500 to 10,000 feet) the low altitude haze top was 1860 meters (6200 feet) with a thin clearer layer and lighter haze above. Distinct haze top of all haze at 2400 meters (8000 feet). Areas of cloud are visible to the north and south. At 1005 GMT at 3000 meters (10,000 feet) scattered cirrus at 6000 meters (20,000 feet) with scattered cumulus far to north, light haze with slant range 16 kilometers (10 miles). Cirrus appears to come down to 3600 to 4500 meters (12,000 to 15,000 feet) in places. On the climb to 6000 meters (20,000 feet) some cirrus trails were heavy to below 4500 meters (15,000 feet), cirrus are in bands with 20 to 30 nautical mile separation. Other cirrus extend up to 10500 meters (35,000 feet); basic layer is at 6000 meters (20,000 feet). At 1130 GMT at 1350 meters (4500 feet) there was scattered altostratus at 1500 meters (5000 feet) and scattered cirrus at 9000 meters (30,000 feet) with moderate to heavy haze and slant range 6.4 to 8 kilometers (4 to 5 miles). At 1145 GMT on the climb to 3000 meters (10,000 feet) it was noted that cumulus were beginning. Cirrus was present during the first half with a moderate wall to the south. A new band of cirrus was moving in from the north at a higher altitude than previously. The cumulus tended to blend into bright haze in the up sun direction. On the final descent the cumulus field was developing further along and to the south of the west end of the track. Cumulus tops were 2700 meters (9000 feet) and the haze top was now closer to 2100 meters (7000 feet). Visibility at the top of the haze layer was very poor. Visibility below 2700 meters (3000 feet) seems lower than previous.

Local Weather Notes. Bremerhaven, 87.1 kilometers northeast of track center, reported scattered high thin cirrus clouds becoming broken at 6900 meters (23,000 feet) by 1300 GMT. Visibility of 5 kilometers in haze improved to 9 kilometers by 1300 GMT.

Emden, 45.7 kilometers northwest of the track center, recorded 1/8 to 2/8 high thin cirrus becoming 5/8 broken at 6900 meters (23,000 feet) at 1200 GMT. Visibility of 4.5 kilometers in haze improved to 9 kilometers by 1000 GMT and decreased to 8 kilometers at 1200 GMT.

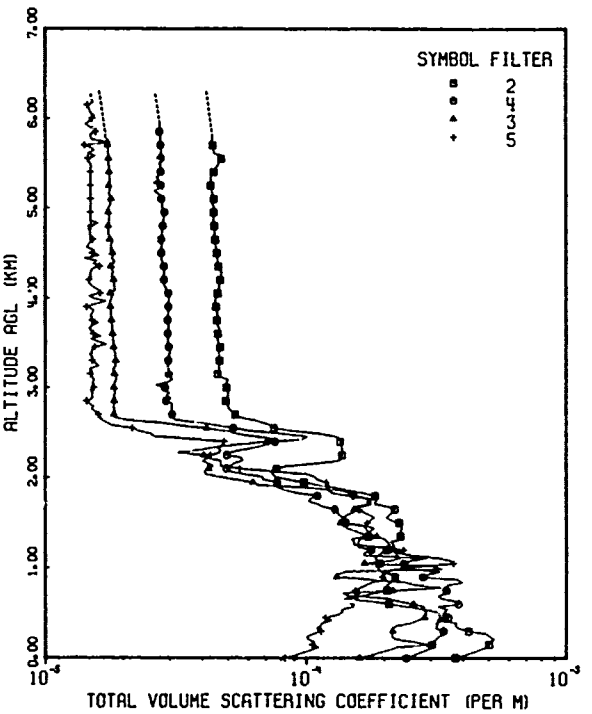
Bremen, 79.3 kilometers east of the track center, reported 3/8 decreasing to 1/8 high thin cirrus with visibility 8 to 15 kilometers

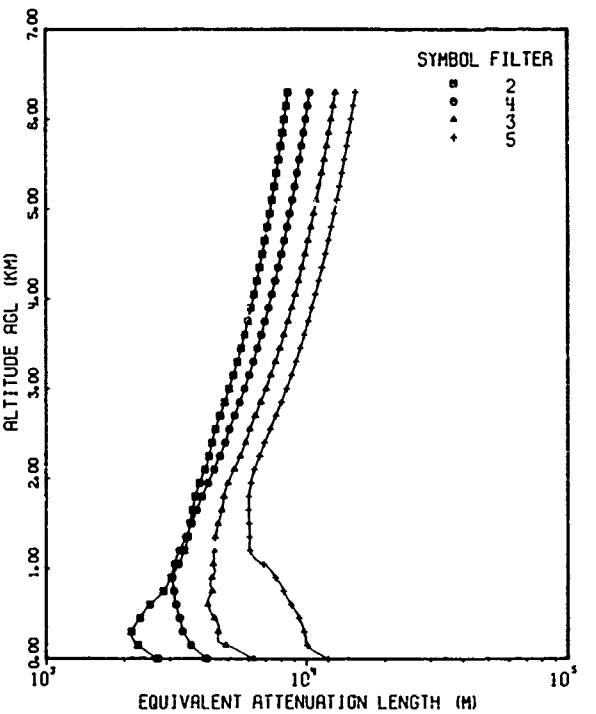
The radiosonde station at Bergen was 149 kilometers east and downstream from the track. The raob showed a warming trend below 400 millibars and cooler above than the sounding taken six hours earlier.

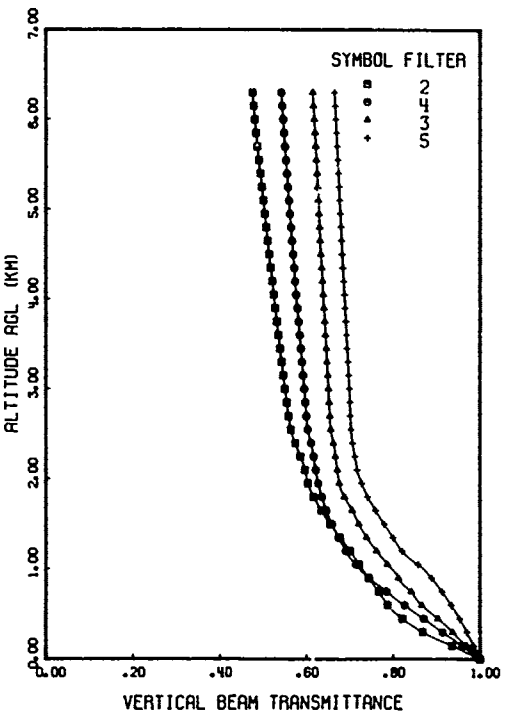
Synoptic Remarks. The surface chart for 0000 GMT showed an occluded front that extended from north of the Arctic Circle southeast and south to near Oslo then as a cold front southsouthwest through the North Sea to Belgium and off the west coast of Morocco with a wave near Madrid. The front was approaching the flight track and there was southwesterly flow over the track At 1200 GMT the cold front had passed over the track and was on a line from southern Norway, Bremen, Offenbach, Avignon to Fes. There was a weak cell of high pressure centered two degrees west of Brest. Flow over the track was west-southwesterly. At 500 millibars at 0000 GMT there was weak ridging from northern Italy to northern Scandinavia and a closed low just southeast of Iceland. At 1200 GMT there was ridging from Spain northeastward to Latvia. The track had weak northwesterly flow at this level. The air mass was modified maritime polar. The satellite maps for 1259 and 1309 GMT showed thin clouds over all of western Europe and a frontal system approaching Great Britain.

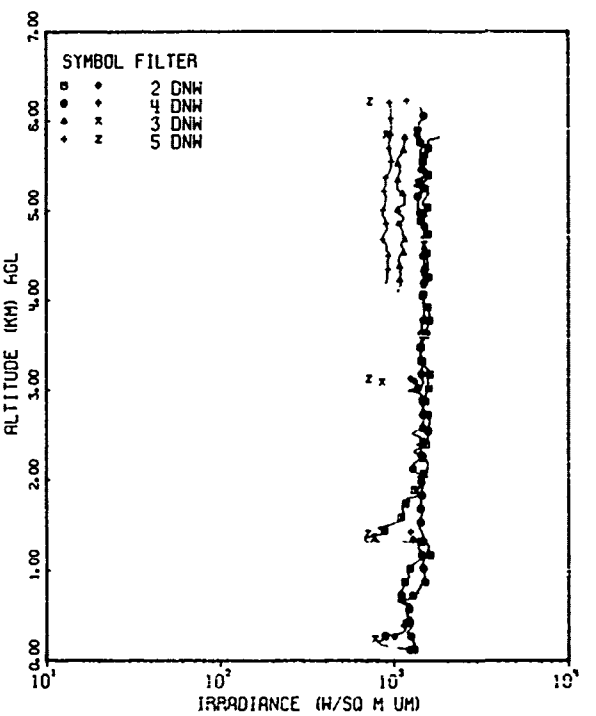
FLIGHT NO. C-468

MEPPEN









FLIGHT NO. C-468
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5193 DATE 05/16/80)
DATE 82178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	3.74E-04	2.42E-04	1.60E-04	8.28E-05
30	4.04E-04	2.58E-04	1.76E-04	8.99E-05
60	4.33E-04	2.74E-04	1.91E-04	9.70E-05
90	4.63E-04	2.89E-04	2.07E-04	1.04E-04
120	4.92E-04	3.05E-04	2.22E-04	1.11E-04
150	5.02E-04	3.04E-04	2.99E-04	1.05E-04
180	5.04E-04	3.06E-04	2.57E-04	1.07E-04
210	5.23E-04	3.16E-04	2.20E-04	1.01E-04
240	5.06E-04	3.23E-04	2.13E-04	1.01E-04
270	4.90E-04	3.42E-04	2.14E-04	1.07E-04
300	4.20E-04	3.36E-04	2.15E-04	1.14E-04
330	3.86E-04	3.14E-04	2.13E-04	1.09E-04
360	3.72E-04	3.18E-04	2.23E-04	1.13E-04
390	3.77E-04	3.16E-04	2.53E-04	1.16E-04
420	3.20E-04	3.32E-04	2.69E-04	1.25E-04
450	3.31E-04	3.50E-04	2.85E-04	1.18E-04
480	3.26E-04	3.51E-04	2.88E-04	1.33E-04
510	3.19E-04	3.37E-04	2.88E-04	1.38E-04
540	2.81E-04	3.48E-04	2.82E-04	1.37E-04
570	2.50E-04	3.21E-04	2.83E-04	1.51E-04
600	2.08E-04	3.84E-04	2.58E-04	1.51E-04
630	1.80E-04	3.73E-04	2.26E-04	1.53E-04
660	1.40E-04	3.30E-04	2.08E-04	1.57E-04
690	1.61E-04	3.22E-04	1.45E-04	1.53E-04
720	1.83E-04	3.43E-04	1.39E-04	1.60E-04
750	2.04E-04	3.45E-04	2.15E-04	1.55E-04
780	2.06E-04	3.43E-04	2.28E-04	1.61E-04
810	2.04E-04	3.49E-04	2.64E-04	1.59E-04
840	2.10E-04	3.96E-04	2.43E-04	1.78E-04
870	2.15E-04	3.81E-04	1.76E-04	2.02E-04
900	2.20E-04	2.80E-04	1.31E-04	1.96E-04
930	2.12E-04	2.93E-04	1.33E-04	1.98E-04
960	1.95E-04	3.24E-04	1.42E-04	2.04E-04
990	1.89E-04	2.49E-04	3.30E-04	2.22E-04
1020	1.88E-04	2.45E-04	3.08E-04	2.79E-04
1050	1.91E-04	2.37E-04	1.67E-04	3.66E-04
1080	1.86E-04	2.52E-04	2.09E-04	3.56E-04
1110	1.84E-04	2.88E-04	2.28E-04	3.20E-04
1140	1.89E-04	1.66E-04	2.22E-04	2.56E-04
1170	1.95E-04	1.67E-04	2.21E-04	2.23E-04
1200	2.04E-04	1.78E-04	2.17E-04	2.37E-04
1230	2.14E-04	1.58E-04	2.01E-04	1.95E-04
1260	2.17E-04	1.58E-04	2.09E-04	1.52E-04
1290	2.11E-04	1.58E-04	2.05E-04	1.52E-04
1320	2.34E-04	1.61E-04	2.02E-04	1.49E-04
1350	2.30E-04	1.74E-04	1.86E-04	1.68E-04
1380	2.29E-04	1.64E-04	1.74E-04	1.72E-04
1410	2.31E-04	1.54E-04	1.71E-04	1.76E-04
1440	2.33E-04	1.44E-04	1.68E-04	1.82E-04
1470	2.32E-04	1.40E-04	1.65E-04	1.69E-04
1500	2.28E-04	1.41E-04	1.35E-04	1.71E-04

FLIGHT NO. C-468
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5193 DATE 05/16/80)
DATE 82178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 19

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	2.12E-04	1.46E-04	1.37E-04	1.75E-04
1560	2.03E-04	1.39E-04	1.38E-04	1.82E-04
1590	2.08E-04	1.33E-04	1.43E-04	1.75E-04
1620	2.15E-04	1.32E-04	1.51E-04	1.65E-04
1650	2.19E-04	1.28E-04	1.53E-04	1.59E-04
1680	2.07E-04	1.16E-04	1.59E-04	1.54E-04
1710	1.83E-04	1.10E-04	1.75E-04	1.73E-04
1740	1.84E-04	1.02E-04	1.76E-04	1.71E-04
1770	1.86E-04	1.04E-04	1.75E-04	1.74E-04
1800	1.83E-04	1.10E-04	1.54E-04	1.51E-04
1830	1.66E-04	9.34E-05	1.50E-04	1.27E-04
1860	1.45E-04	8.43E-05	1.36E-04	1.21E-04
1890	1.31E-04	7.80E-05	1.01E-04	1.21E-04
1920	1.10E-04	7.54E-05	6.49E-05	1.22E-04
1950	9.79E-05	7.72E-05	6.22E-05	1.19E-04
1980	8.62E-05	6.78E-05	5.33E-05	1.10E-04
2010	7.58E-05	6.77E-05	4.66E-05	1.08E-04
2040	7.44E-05	5.86E-05	4.10E-05	1.00E-04
2070	7.27E-05	5.07E-05	4.05E-05	7.75E-05
2100	7.68E-05	4.93E-05	4.21E-05	5.54E-05
2130	8.34E-05	5.09E-05	4.37E-05	4.67E-05
2160	1.09E-04	5.29E-05	4.18E-05	4.68E-05
2190	1.35E-04	5.67E-05	3.99E-05	4.68E-05
2220	1.36E-04	5.63E-05	4.19E-05	4.10E-05
2250	1.37E-04	4.94E-05	4.03E-05	4.27E-05
2280	1.37E-04	5.10E-05	3.22E-05	4.51E-05
2310	1.38E-04	5.65E-05	3.95E-05	4.68E-05
2340	1.37E-04	6.34E-05	4.45E-05	4.54E-05
2370	1.37E-04	7.09E-05	5.48E-05	4.78E-05
2400	1.35E-04	7.58E-05	7.03E-05	4.82E-05
2430	1.36E-04	9.61E-05	7.50E-05	3.75E-05
2460	1.28E-04	1.00E-04	6.37E-05	2.60E-05
2490	1.12E-04	8.19E-05	5.36E-05	2.53E-05
2520	8.88E-05	6.09E-05	5.01E-05	2.27E-05
2550	7.50E-05	5.23E-05	4.14E-05	2.15E-05
2580	7.37E-05	4.53E-05	3.29E-05	1.80E-05
2610	6.86E-05	3.92E-05	2.78E-05	1.72E-05
2640	6.34E-05	3.15E-05	2.06E-05	1.64E-05
2670	5.59E-05	3.06E-05	1.83E-05	1.62E-05
2700	5.33E-05	3.05E-05	1.83E-05	1.60E-05
2730	5.20E-05	3.05E-05	1.85E-05	1.56E-05
2760	5.06E-05	3.05E-05	1.83E-05	1.50E-05
2790	4.98E-05	3.05E-05	1.82E-05	1.52E-05
2820	4.96E-05	3.06E-05	1.83E-05	1.48E-05
2850	4.90E-05	2.89E-05	1.84E-05	1.44E-05
2880	4.90E-05	3.01E-05	1.84E-05	1.52E-05
2910	5.00E-05	2.89E-05	1.82E-05	1.51E-05
2940	4.98E-05	2.98E-05	1.85E-05	1.51E-05
2970	4.96E-05	2.82E-05	1.84E-05	1.49E-05
3000	4.93E-05	2.87E-05	1.83E-05	1.53E-05

FLIGHT NO. C-468
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5193 DATE 05/16/80)
DATE 82178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.93E-05	2.65E-05	1.84E-05	1.51E-05
3060	4.92E-05	2.94E-05	1.84E-05	1.52E-05
3090	4.99E-05	3.06E-05	1.86E-05	1.53E-05
3120	4.65E-05	3.01E-05	1.85E-05	1.51E-05
3150	4.55E-05	2.96E-05	1.84E-05	1.48E-05
3180	4.59E-05	2.95E-05	1.83E-05	1.51E-05
3210	4.62E-05	2.95E-05	1.82E-05	1.48E-05
3240	4.61E-05	2.95E-05	1.86E-05	1.60E-05
3270	4.63E-05	2.95E-05	1.86E-05	1.55E-05
3300	4.63E-05	2.96E-05	1.86E-05	1.51E-05
3330	4.62E-05	2.97E-05	1.85E-05	1.52E-05
3360	4.62E-05	2.98E-05	1.85E-05	1.49E-05
3390	4.61E-05	3.01E-05	1.85E-05	1.51E-05
3420	4.63E-05	3.00E-05	1.82E-05	1.51E-05
3450	4.66E-05	2.97E-05	1.82E-05	1.55E-05
3480	4.61E-05	2.96E-05	1.82E-05	1.70E-05
3510	4.57E-05	2.95E-05	1.82E-05	1.60E-05
3540	4.54E-05	2.95E-05	1.81E-05	1.50E-05
3570	4.57E-05	2.94E-05	1.81E-05	1.63E-05
3600	4.57E-05	2.94E-05	1.81E-05	1.53E-05
3630	4.62E-05	2.96E-05	1.80E-05	1.51E-05
3660	4.62E-05	2.95E-05	1.80E-05	1.47E-05
3690	4.56E-05	2.95E-05	1.80E-05	1.50E-05
3720	4.54E-05	2.94E-05	1.79E-05	1.59E-05
3750	4.53E-05	2.93E-05	1.79E-05	1.51E-05
3780	4.58E-05	2.94E-05	1.79E-05	1.50E-05
3810	4.54E-05	2.95E-05	1.78E-05	1.49E-05
3840	4.53E-05	2.95E-05	1.78E-05	1.52E-05
3870	4.53E-05	2.95E-05	1.78E-05	1.52E-05
3900	4.50E-05	2.95E-05	1.77E-05	1.43E-05
3930	4.53E-05	2.95E-05	1.76E-05	1.55E-05
3960	4.45E-05	2.96E-05	1.77E-05	1.70E-05
3990	4.47E-05	2.96E-05	1.79E-05	1.54E-05
4020	4.55E-05	2.98E-05	1.80E-05	1.47E-05
4050	4.57E-05	2.95E-05	1.77E-05	1.62E-05
4080	4.58E-05	2.90E-05	1.84E-05	1.61E-05
4110	4.60E-05	2.88E-05	1.83E-05	1.55E-05
4140	4.62E-05	2.84E-05	1.83E-05	1.49E-05
4170	4.64E-05	2.82E-05	1.83E-05	1.46E-05
4200	4.66E-05	2.84E-05	1.82E-05	1.47E-05
4230	4.68E-05	2.84E-05	1.79E-05	1.50E-05
4260	4.70E-05	2.83E-05	1.80E-05	1.48E-05
4290	4.72E-05	2.84E-05	1.81E-05	1.49E-05
4320	4.64E-05	2.85E-05	1.79E-05	1.51E-05
4350	4.59E-05	2.84E-05	1.78E-05	1.61E-05
4380	4.57E-05	2.82E-05	1.81E-05	1.53E-05
4410	4.56E-05	2.79E-05	1.84E-05	1.57E-05
4440	4.54E-05	2.78E-05	1.80E-05	1.41E-05
4470	4.53E-05	2.78E-05	1.81E-05	1.60E-05
4500	4.51E-05	2.78E-05	1.80E-05	1.50E-05

FLIGHT NO. C-468
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5193 DATE 05/16/80)
DATE 82178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2		3	5
4530	4.50E-05	2.7[illegible]-05	1.78E-05	1.54E-05
4560	4.49E-05	2.7[illegible]-05	1.79E-05	1.44E-05
4590	4.48E-05	2.78 -05	1.77E-05	1.45E-05
4620	4.45E-05	2.77E-05	1.80E-05	1.49E-05
4650	4.46E-05	2.77E-05	1.76E-05	1.52E-05
4680	4.43E-05	2.78E-05	1.77E-05	1.48E-05
4710	4.43E-05	2.79E-05	1.73E-05	1.48E-05
4740	4.43E-05	2.80E-05	1.74E-05	1.48E-05
4770	4.45E-05	2.81E-05	1.73E-05	1.46E-05
4800	4.42E-05	2.81E-05	1.74E-05	1.49E-05
4830	4.42E-05	2.82E-05	1.75E-05	1.59E-05
4860	4.38E-05	2.83E-05	1.75E-05	1.48E-05
4890	4.39E-05	2.84E-05	1.75E-05	1.49E-05
4920	4.42E-05	2.85E-05	1.75E-05	1.49E-05
4950	4.39E-05	2.85E-05	1.74E-05	1.49E-05
4980	4.44E-05	2.81E-05	1.72E-05	1.49E-05
5010	4.40E-05	2.80E-05	1.75E-05	1.49E-05
5040	4.35E-05	2.80E-05	1.77E-05	1.49E-05
5070	4.41E-05	2.78E-05	1.76E-05	1.49E-05
5100	4.40E-05	2.77E-05	1.78E-05	1.49E-05
5130	4.37E-05	2.74E-05	1.76E-05	1.49E-05
5160	4.34E-05	2.71E-05	1.75E-05	1.49E-05
5190	4.31E-05	2.61E-05	1.76E-05	1.49E-05
5220	4.31E-05	2.77E-05	1.77E-05	1.49E-05
5250	4.27E-05	2.77E-05	1.75E-05	1.49E-05
5280	4.27E-05	2.60E-05	1.76E-05	1.49E-05
5310	4.29E-05	2.73E-05	1.76E-05	1.49E-05
5340	4.28E-05	2.65E-05	1.75E-05	1.49E-05
5370	4.34E-05	2.76E-05	1.75E-05	1.49E-05
5400	4.40E-05	2.76E-05	1.75E-05	1.49E-05
5430	4.46E-05	2.77E-05	1.75E-05	1.49E-05
5460	4.52E-05	2.76E-05	1.75E-05	1.49E-05
5490	4.58E-05	2.74E-05	1.74E-05	1.48E-05
5520	4.64E-05	2.76E-05	1.74E-05	1.47E-05
5550	4.70E-05	2.76E-05	1.74E-05	1.45E-05
5580	4.77E-05	2.77E-05	1.74E-05	1.55E-05
5610	4.40E-05	2.77E-05	1.74E-05	1.45E-05
5640	4.39E-05	2.77E-05	1.73E-05	1.53E-05
5670	4.37E-05	2.76E-05	1.73E-05	1.50E-05
5700	4.35E-05	2.76E-05	1.73E-05	1.41E-05
5730	4.31E-05	2.75E-05	1.73E-05	1.76E-05
5760	4.33E-05	2.75E-05	1.73E-05	1.51E-05
5790	4.33E-05	2.75E-05	1.69E-05	1.49E-05
5820	4.33E-05	2.74E-05	1.70E-05	1.48E-05
5850	(4.32E-05)	2.73E-05	(1.69E-05)	1.56E-05
5880	(4.31E-05)	2.76E-05	(1.68E-05)	1.54E-05
5910	(4.29E-05)	2.73E-05	(1.68E-05)	1.46E-05
5940	(4.28E-05)	2.75E-05	(1.67E-05)	1.43E-05
5970	(4.26E-05)	2.73E-05	(1.67E-05)	1.47E-05
6000	(4.25E-05)	(2.72E-05)	(1.66E-05)	1.51E-05

FLIGHT NO. C-468
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5193 DATE 05/16/80)
DATE 82178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3	5
6030		(4.24E-05)	(2.71E-05)	(1.65E-05)	1.54E-05
6060		(4.22E-05)	(2.70E-05)	(1.65E-05)	1.49E-05
6090		(4.21E-05)	(2.69E-05)	(1.65E-05)	1.48E-05
6120		(4.20E-05)	(2.68E-05)	(1.64E-05)	1.46E-05
6150		(4.18E-05)	(2.68E-05)	(1.64E-05)	1.45E-05
6180		(4.17E-05)	(2.67E-05)	(1.63E-05)	1.52E-05
6210		(4.16E-05)	(2.66E-05)	(1.63E-05)	1.50E-05
6240		(4.14E-05)	(2.65E-05)	(1.62E-05)	(1.49E-05)
6270		(4.13E-05)	(2.64E-05)	(1.62E-05)	(1.49E-05)
6300		(4.12E-05)	(2.63E-05)	(1.61E-05)	(1.48E-05)
FIRST DATA ALT		0	0	0	0
LAST DATA ALT		5820	5970	5820	6210

FLIGHT NO. C-468
EQUIVALENT ATTENUATION LENGTH

(JOB 5193 DATE 05/16/80)
DATE 92178 FLIGHT NO. C-468 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	2.67E 03	4.13E 03	6.25E 03	1.21E 04
300	2.12E 03	3.34E 03	4.57E 03	9.79E 03
600	2.50E 03	3.15E 03	4.16E 03	8.72E 03
900	3.03E 03	3.04E 03	4.32E 03	7.59E 03
1200	3.38E 03	3.25E 03	4.41E 03	6.06E 03
1500	3.55E 03	3.60E 03	4.57E 03	6.01E 03
1800	3.72E 03	3.97E 03	4.81E 03	5.00E 03
2100	4.07E 03	4.41E 03	5.27E 03	6.30E 03
2400	4.33E 03	4.87E 03	5.83E 03	6.91E 03
2700	4.65E 03	5.29E 03	6.36E 03	7.62E 03
3000	5.04E 03	5.78E 03	6.98E 03	8.36E 03
3300	5.41E 03	6.25E 03	7.58E 03	9.08E 03
3600	5.77E 03	6.70E 03	8.17E 03	9.78E 03
3900	6.12E 03	7.14E 03	8.74E 03	1.05E 04
4200	6.45E 03	7.57E 03	9.30E 03	1.11E 04
4500	6.77E 03	7.99E 03	9.85E 03	1.18E 04
4800	7.08E 03	8.40E 03	1.04E 04	1.24E 04
5100	7.38E 03	8.79E 03	1.09E 04	1.31E 04
5400	7.67E 03	9.18E 03	1.14E 04	1.37E 04
5700	7.94E 03	9.56E 03	1.19E 04	1.43E 04
6000	8.21E 03	9.92E 03	1.24E 04	1.48E 04
6300	8.47E 03	1.03E 04	1.29E 04	1.54E 04

FLIGHT NO. C-468
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.68E-01	9.14E-01	9.37E-01	9.70E-01
600	7.87E-01	8.26E-01	8.66E-01	9.33E-01
900	7.43E-01	7.44E-01	8.12E-01	8.88E-01
1200	7.01E-01	6.91E-01	7.62E-01	8.20E-01
1500	6.55E-01	6.59E-01	7.20E-01	7.79E-01
1800	6.17E-01	6.35E-01	6.88E-01	7.41E-01
2100	5.97E-01	6.21E-01	6.71E-01	7.16E-01
2400	5.75E-01	6.11E-01	6.63E-01	7.07E-01
2700	5.60E-01	6.00E-01	6.54E-01	7.02E-01
3000	5.51E-01	5.95E-01	6.51E-01	6.99E-01
3300	5.43E-01	5.90E-01	6.47E-01	6.95E-01
3600	5.36E-01	5.84E-01	6.44E-01	6.92E-01
3900	5.29E-01	5.79E-01	6.40E-01	6.89E-01
4200	5.21E-01	5.74E-01	6.37E-01	6.86E-01
4500	5.14E-01	5.69E-01	6.33E-01	6.83E-01
4800	5.07E-01	5.65E-01	6.30E-01	6.80E-01
5100	5.01E-01	5.60E-01	6.27E-01	6.77E-01
5400	4.94E-01	5.55E-01	6.23E-01	6.74E-01
5700	4.88E-01	5.51E-01	6.20E-01	6.71E-01
6000	4.81E-01	5.46E-01	6.17E-01	6.68E-01
6300	4.75E-01	5.42E-01	6.14E-01	6.65E-01

FLIGHT C-469 - 22 AUGUST 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1158	1337	1.65	41.5	-	48.3	90	5820
4,5	1342	1527	1.75	48.6	-	62.1	90	5880

Flight Description. Flight C-469 was an afternoon flight with take off at 1102 and landing at 1615 GMT. There were scattered to broken cumulus clouds. Track was gradually slipped south to 260-080 track from east end turn point. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that on the let downs the haze top was 900 meters (3000 feet) with isolated cumulus trying to form at the top of haze. The haze was very dense on the east end and slightly less dense on the west end of the track. At 1200 GMT and 300 meters (1000 feet) there were isolated cumulus at 900 meters (3000 feet) and heavy haze with slant range 4.8 kilometers (3 miles). At 1216 GMT we were trying run at 750 meters (2500 feet) at the same altitude as incipient clouds at top of haze. We were just below the haze top. The haze was still very dense at this altitude. On the climb to 2400 meters (8000 feet) the haze top was 900 meters (3000 feet); there was a second dense layer with base at 1200 meters (4000 feet) top at 1500 meters (5000 feet) and more thinner layers above to 2100 meters (7000 feet). At 1245 GMT at the start there was a solid cumulus field to the north by 6.4 kilometers (4 miles) angling sharply away from the track to the east. At 1315 GMT at 5700 meters (19,000 feet) at the start broken cumulus line to the north are greater than 75° from nadir and it was clear below. On the descent to 300 meters (1000 feet) there was very light haze down to 1950 meters (6500 feet). At 1950 meters start entering significant haze; clear layer 1650 to 1200 meters and relatively uniform below 1200 meters. At 1340 GMT at 300 meters (1000 feet) it was clear with moderate to heavy haze and a slant range of 9.6 kilometers (6 miles). The haze was brown in color and a line of broken cumulus was slowly sliding down from the north but we were staying ahead of them. At 1405 GMT at 900 meters it was clear to the south; cumulus clouds still to the north and west of the west end of the track with bases at 1050 meters (3500 feet). On the climb to 2400 meters the haze top was 1390 meters (4300 feet) and light haze was still visible above. There was a clear layer from 1200 to 1500 meters then into light haze again. Cumulus line to the north was still pressing south. At 1500 GMT at 5700 meters (19,000 feet) scattered variable broken cumulus to the northwest, north and northeast. Horizon is indistinct in light haze. At the start of straight and level the line of cumulus was just north of the track. On the descent from 6000 meters it was clear down to light haze top at 2700 meters, this was south of the cumulus to the north; denser haze at 1950 meters; clear from 1500 to 1290 meters; and in heavy low level haze at 1290 meters. Visibility was still less than 8 kilometers (5 miles) in haze.

Local Weather Notes. DeBilt, 32.1 kilometers northwest of track center, reported 1/8 to 5/8 cumulus at 900 meters (3000 feet) with visibility 6 to 7 kilometers in light fog and haze.

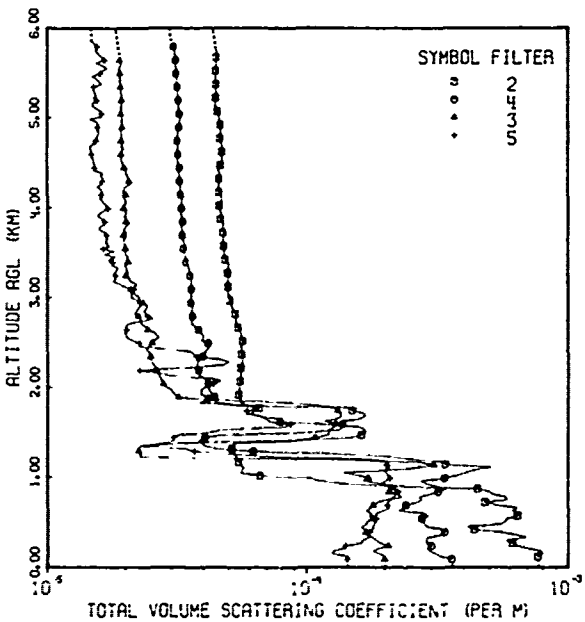
Soesterberg, 30.3 kilometers northwest of track center reported cumulus increasing from 3/8 to 7/8 at 1050 to 1140 meters (3500 to 3800 feet) and visibility 7 kilometers in haze.

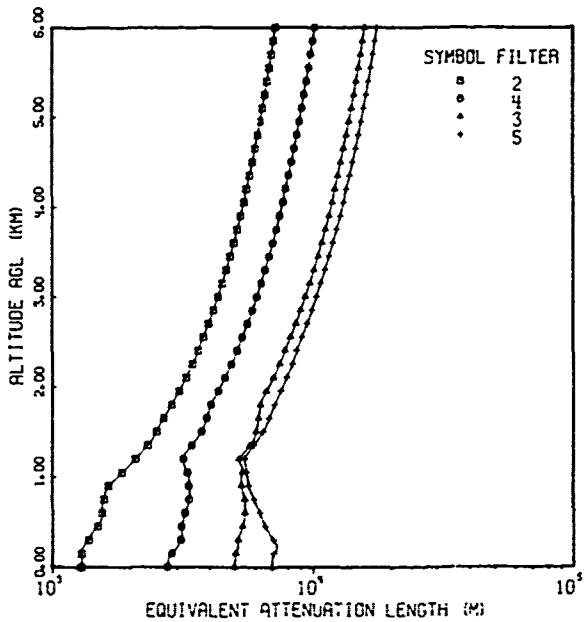
Deelen, 26.3 kilometers northeast of track center, recorded 1/8 to 2/8 cumulus at 1050 meters (3500 feet) and visibility 4.8 kilometers in haze gradually improving to 10 kilometers.

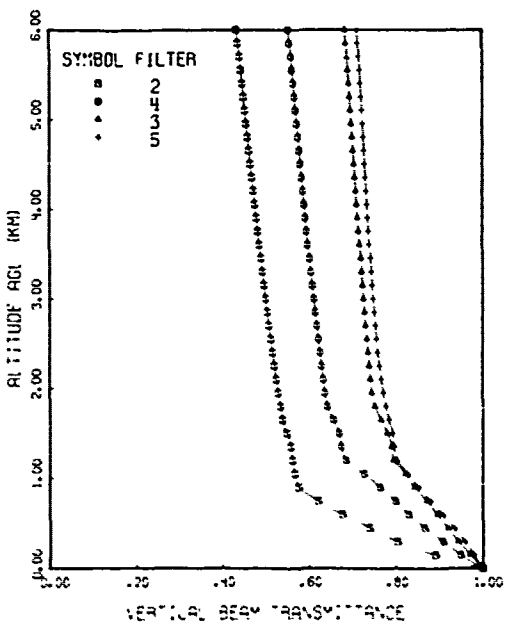
The radiosonde station at DeBilt was 32.1 kilometers northwest and in a flow parallel to the track. The sounding showed a warming trend at all levels except from 470 to 300 millibars The winds aloft backed from 320° to 240-260°.

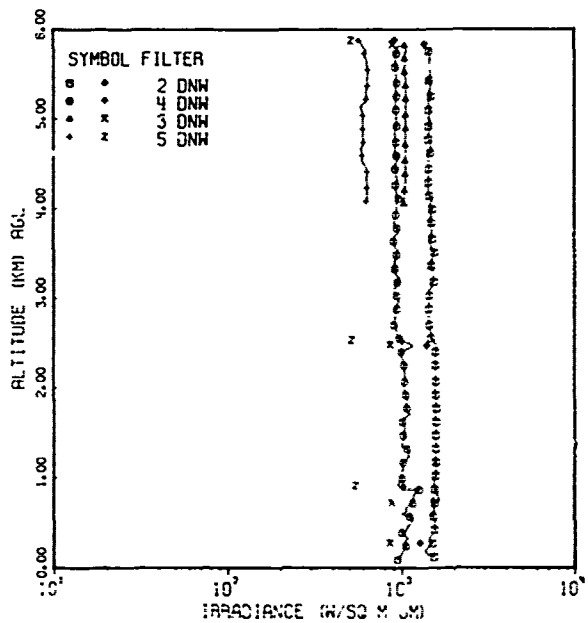
Synoptic Remarks. The surface chart for 0000 GMT showed a weakening cold front was east of the track along the Oslo-Rostock-Bamberg line. A weak high pressure cell was centered west of Brest and there was a weak gradient over the track. At 1200 GMT a low centered at 68°N 5°E had a trough southsouthwest over the track area with surface flow light westerly. The weakening cold front continued to move east and was in western Russia. The weak high continued west of Ireland and France. The 500 millibar chart for 0000 GMT showed weak ridging from Spain to the Gulf of Bothnia, with a low centered at 65°N 5°W. At 1200 GMT the low was located at 67.5°N 1°W with troughing southward to the Irish Sea. There was weak ridging from southern France to western Poland. The track had moderate westerly flow at this level. The air mass was maritime polar. The satellite map for 1300 GMT had clear skies or thin scattered clouds over all of western Europe.

FLIGHT NO. C-469
SOESTERBERG









FLIGHT NO. C-469
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4068 DATE 05/19/80)
DATE 82278 FLIGHT NO. C-469 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(7.76E-04)	(3.43E-04)	(2.01E-04)	(1.45E-04)
30	(7.72E-04)	(3.61E-04)	(2.00E-04)	(1.44E-04)
60	(7.70E-04)	(3.61E-04	(1.99E-04)	(1.43E-04)
90	(7.69E-04)	3.60E-04	1.99E-04	1.43E-04
120	7.67E-04	3.27E-04	2.00E-04	1.45E-04
150	7.96E-04	3.14E-04	1.92E-04	1.25E-04
180	7.90E-04	2.97E-04	1.80E-04	1.26E-04
210	6.96E-04	2.90E-04	1.87E-04	1.38E-04
240	6.36E-04	3.00E-04	2.05E-04	1.41E-04
270	6.12E-04	2.89E-04	1.92E-04	1.63E-04
300	5.82E-04	2.87E-04	1.85E-04	1.64E-04
330	6.87E-04	2.89E-04	1.79E-04	1.72E-04
360	6.30E-04	3.27E-04	1.69E-04	1.75E-04
390	5.59E-04	3.38E-04	1.69E-04	1.74E-04
420	4.37E-04	3.39E-04	1.66E-04	1.79E-04
450	4.13E-04	2.89E-04	1.62E-04	1.79E-04
480	5.49E-04	2.83E-04	1.69E-04	1.81E-04
510	5.76E-04	2.76E-04	1.71E-04	1.83E-04
540	5.82E-04	2.75E-04	1.80E-04	1.84E-04
570	6.38E-04	2.91E-04	1.75E-04	1.84E-04
600	6.61E-04	2.81E-04	1.76E-04	1.84E-04
630	6.11E-04	2.25E-04	1.69E-04	1.96E-04
660	6.38E-04	2.38E-04	1.76E-04	2.07E-04
690	5.42E-04	2.41E-04	1.80E-04	2.04E-04
720	4.82E-04	2.64E-04	1.85E-04	2.05E-04
750	5.85E-04	2.77E-04	2.00E-04	2.10E-04
780	5.80E-04	2.71E-04	2.31E-04	2.15E-04
810	5.16E-04	2.92E-04	2.26E-04	2.19E-04
840	5.00E-04	3.20E-04	2.07E-04	2.25E-04
870	4.51E-04	3.43E-04	2.12E-04	2.18E-04
900	2.27E-04	3.16E-04	2.22E-04	2.05E-04
930	1.34E-04	2.88E-04	1.96E-04	1.93E-04
960	1.10E-04	2.75E-04	1.65E-04	2.01E-04
990	1.04E-04	3.38E-04	1.72E-04	2.09E-04
1020	6.59E-05	3.76E-04	1.60E-04	2.06E-04
1050	5.61E-05	4.04E-04	1.39E-04	2.02E-04
1080	5.62E-05	4.31E-04	1.98E-04	1.99E-04
1110	5.72E-05	5.07E-04	2.62E-04	2.08E-04
1140	5.56E-05	3.39E-04	3.07E-04	2.03E-04
1170	5.47E-05	3.51E-04	2.69E-04	2.05E-04
1200	5.44E-05	2.53E-04	1.12E-04	1.76E-04
1230	5.34E-05	2.08E-04	2.27E-05	7.50E-05
1260	5.25E-05	1.21E-04	2.28E-05	5.07E-05
1290	5.21E-05	5.22E-05	2.25E-05	3.59E-05
1320	5.14E-05	4.47E-05	2.24E-05	3.38E-05
1350	5.18E-05	4.05E-05	2.29E-05	2.32E-05
1380	5.28E-05	3.94E-05	3.28E-05	2.85E-05
1410	9.15E-05	3.87E-05	9.38E-05	3.07E-05
1440	1.47E-04	4.05E-05	1.07E-04	3.07E-05
1470	1.62E-04	4.62E-05	1.21E-04	3.23E-05
1500	1.68E-04	1.06E-04	1.22E-04	4.28E-05

FLIGHT NO. C-469
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4068 DATE 05/19/80)
DATE 82278 FLIGHT NO. C-469 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.46E-04	1.34E-04	1.22E-04	4.78E-05
1560	1.58E-04	1.38E-04	1.28E-04	8.20E-05
1590	1.14E-04	1.37E-04	1.29E-04	8.67E-05
1620	7.89E-05	1.35E-04	1.17E-04	7.19E-05
1650	7.88E-05	1.60E-04	1.32E-04	6.96E-05
1680	6.55E-05	1.67E-04	1.35E-04	6.62E-05
1710	6.09E-05	1.66E-04	1.35E-04	5.91E-05
1740	6.25E-05	1.49E-04	1.31E-04	5.88E-05
1770	6.53E-05	1.55E-04	1.28E-04	5.56E-05
1800	5.97E-05	5.79E-05	1.09E-04	5.74E-05
1830	5.59E-05	4.44E-05	8.65E-05	3.86E-05
1860	5.55E-05	4.42E-05	4.35E-05	4.41E-05
1890	5.53E-05	4.40E-05	3.20E-05	4.15E-05
1920	5.47E-05	4.31E-05	3.07E-05	3.91E-05
1950	5.48E-05	4.23E-05	3.02E-05	3.92E-05
1980	5.49E-05	4.17E-05	2.98E-05	3.92E-05
2010	5.51E-05	4.18E-05	2.82E-05	4.16E-05
2040	5.52E-05	4.15E-05	2.79E-05	4.36E-05
2070	5.53E-05	4.17E-05	2.76E-05	4.64E-05
2100	5.54E-05	4.02E-05	2.72E-05	4.25E-05
2130	5.56E-05	3.84E-05	2.69E-05	2.98E-05
2160	5.57E-05	3.83E-05	2.66E-05	2.65E-05
2190	5.58E-05	3.82E-05	2.62E-05	2.25E-05
2220	5.57E-05	3.79E-05	2.59E-05	3.52E-05
2250	5.64E-05	3.77E-05	2.56E-05	4.78E-05
2280	5.64E-05	3.79E-05	2.52E-05	4.99E-05
2310	5.64E-05	3.85E-05	2.49E-05	4.61E-05
2340	5.64E-05	3.96E-05	2.49E-05	3.77E-05
2370	5.61E-05	4.04E-05	2.49E-05	3.66E-05
2400	5.62E-05	4.07E-05	2.45E-05	3.55E-05
2430	5.63E-05	4.19E-05	2.42E-05	2.74E-05
2460	5.59E-05	4.20E-05	2.48E-05	2.27E-05
2490	5.77E-05	4.18E-05	2.54E-05	2.27E-05
2520	5.69E-05	3.95E-05	2.58E-05	2.13E-05
2550	5.46E-05	4.01E-05	2.69E-05	2.03E-05
2580	5.59E-05	4.00E-05	2.65E-05	2.01E-05
2610	5.57E-05	3.91E-05	2.58E-05	1.99E-05
2640	5.51E-05	3.84E-05	2.44E-05	2.03E-05
2670	5.45E-05	3.76E-05	2.42E-05	2.01E-05
2700	5.38E-05	3.63E-05	2.32E-05	2.04E-05
2730	5.34E-05	3.62E-05	2.29E-05	2.21E-05
2760	5.30E-05	3.61E-05	2.27E-05	2.55E-05
2790	5.33E-05	3.64E-05	2.24E-05	2.44E-05
2820	5.31E-05	3.62E-05	2.17E-05	2.40E-05
2850	5.28E-05	3.61E-05	2.21E-05	2.36E-05
2880	5.16E-05	3.63E-05	2.24E-05	2.41E-05
2910	5.14E-05	3.65E-05	2.29E-05	2.43E-05
2940	5.06E-05	3.58E-05	2.33E-05	2.28E-05
2970	5.05E-05	3.60E-05	2.22E-05	2.24E-05
3000	5.06E-05	3.60E-05	2.10E-05	2.27E-05

FLIGHT NO. C-469
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4068 DATE 05/19/80)
DATE 82278 FLIGHT NO. C-469 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.99E-05	3.60E-05	2.11E-05	2.18E-05
3060	4.99E-05	3.60E-05	2.11E-05	2.10E-05
3090	4.98E-05	3.60E-05	2.10E-05	2.16E-05
3120	4.98E-05	3.60E-05	2.18E-05	1.97E-05
3150	4.98E-05	3.60E-05	2.20E-05	1.90E-05
3180	4.97E-05	3.60E-05	2.08E-05	1.80E-05
3210	4.97E-05	3.60E-05	2.05E-05	1.83E-05
3240	4.97E-05	3.55E-05	2.01E-05	1.84E-05
3270	4.96E-05	3.54E-05	2.04E-05	1.81E-05
3300	4.97E-05	3.53E-05	2.03E-05	1.86E-05
3330	4.97E-05	3.51E-05	2.01E-05	1.87E-05
3360	5.00E-05	3.50E-05	1.99E-05	1.78E-05
3390	4.96E-05	3.43E-05	2.05E-05	1.79E-05
3420	4.84E-05	3.42E-05	2.02E-05	1.73E-05
3450	4.82E-05	3.40E-05	2.05E-05	1.82E-05
3480	4.80E-05	3.36E-05	1.99E-05	1.66E-05
3510	4.78E-05	3.36E-05	2.00E-05	1.81E-05
3540	4.80E-05	3.34E-05	2.00E-05	1.64E-05
3570	4.78E-05	3.41E-05	1.99E-05	1.74E-05
3600	4.78E-05	3.37E-05	1.98E-05	1.69E-05
3630	4.75E-05	3.33E-05	1.97E-05	1.68E-05
3660	4.75E-05	3.30E-05	1.99E-05	1.71E-05
3690	4.81E-05	3.31E-05	1.97E-05	1.69E-05
3720	4.75E-05	3.32E-05	2.01E-05	1.68E-05
3750	4.74E-05	3.30E-05	1.96E-05	1.59E-05
3780	4.74E-05	3.29E-05	1.99E-05	1.59E-05
3810	4.76E-05	3.30E-05	2.04E-05	1.65E-05
3840	4.77E-05	3.33E-05	2.01E-05	1.67E-05
3870	4.64E-05	3.29E-05	2.02E-05	1.63E-05
3900	4.71E-05	3.29E-05	1.93E-05	1.57E-05
3930	4.70E-05	3.26E-05	2.01E-05	1.58E-05
3960	4.61E-05	3.28E-05	2.00E-05	1.64E-05
3990	4.65E-05	3.29E-05	1.96E-05	1.72E-05
4020	4.59E-05	3.28E-05	1.98E-05	1.68E-05
4050	4.69E-05	3.28E-05	2.01E-05	1.65E-05
4080	4.71E-05	3.30E-05	2.00E-05	1.61E-05
4110	4.68E-05	3.28E-05	1.97E-05	1.60E-05
4140	4.67E-05	3.27E-05	2.01E-05	1.62E-05
4170	4.61E-05	3.27E-05	1.97E-05	1.64E-05
4200	4.63E-05	3.26E-05	1.97E-05	1.61E-05
4230	4.58E-05	3.25E-05	2.01E-05	1.56E-05
4260	4.60E-05	3.23E-05	2.09E-05	1.62E-05
4290	4.59E-05	3.24E-05	2.07E-05	1.63E-05
4320	4.60E-05	3.25E-05	2.05E-05	1.65E-05
4350	4.69E-05	3.24E-05	2.03E-05	1.61E-05
4380	4.61E-05	3.22E-05	2.02E-05	1.64E-05
4410	4.57E-05	3.22E-05	2.00E-05	1.53E-05
4440	4.62E-05	3.24E-05	1.98E-05	1.53E-05
4470	4.66E-05	3.21E-05	1.95E-05	1.52E-05
4500	4.71E-05	3.18E-05	1.95E-05	1.51E-05

FLIGHT NO. C-469
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4068 DATE 05/19/80)
DATE 82278 FLIGHT NO. C-469 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.75E-05	3.18E-05	1.93E-05	1.50E-05
4560	4.73E-05	3.17E-05	1.93E-05	1.49E-05
4590	4.72E-05	3.19E-05	1.93E-05	1.49E-05
4620	4.72E-05	3.18E-05	1.94E-05	1.48E-05
4650	4.74E-05	3.19E-05	1.97E-05	1.47E-05
4680	4.71E-05	3.19E-05	1.93E-05	1.46E-05
4710	4.69E-05	3.18E-05	1.95E-05	1.52E-05
4740	4.64E-05	3.17E-05	1.93E-05	1.54E-05
4770	4.63E-05	3.18E-05	1.94E-05	1.56E-05
4800	4.70E-05	3.18E-05	1.94E-05	1.57E-05
4830	4.66E-05	3.20E-05	1.93E-05	1.59E-05
4860	4.67E-05	3.21E-05	1.93E-05	1.58E-05
4830	4.68E-05	3.22E-05	1.95E-05	1.56E-05
4920	4.65E-05	3.24E-05	1.93E-05	1.58E-05
4950	4.60E-05	3.25E-05	1.94E-05	1.55E-05
4980	4.59E-05	3.27E-05	1.95E-05	1.46E-05
5010	4.59E-05	3.28E-05	1.94E-05	1.61E-05
5040	4.57E-05	3.24E-05	1.92E-05	1.63E-05
5070	4.54E-05	3.21E-05	1.93E-05	1.60E-05
5100	4.43E-05	3.22E-05	1.94E-05	1.55E-05
5130	4.46E-05	3.20E-05	1.94E-05	1.49E-05
5160	4.44E-05	3.22E-05	1.94E-05	1.50E-05
5190	4.48E-05	3.20E-05	1.94E-05	1.56E-05
5220	4.47E-05	3.21E-05	1.93E-05	1.51E-05
5250	4.48E-05	3.18E-05	1.95E-05	1.55E-05
5280	4.49E-05	3.18E-05	1.93E-05	1.52E-05
5310	4.47E-05	3.18E-05	1.92E-05	1.52E-05
5340	4.47E-05	3.17E-05	1.92E-05	1.51E-05
5370	4.47E-05	3.15E-05	1.91E-05	1.63E-05
5400	4.47E-05	3.15E-05	1.90E-05	1.59E-05
5430	4.46E-05	3.15E-05	1.92E-05	1.55E-05
5460	4.44E-05	3.14E-05	1.90E-05	1.49E-05
5490	4.46E-05	3.13E-05	1.91E-05	1.60E-05
5520	4.47E-05	3.13E-05	1.89E-05	1.63E-05
5550	4.47E-05	3.12E-05	1.90E-05	1.71E-05
5580	4.47E-05	3.12E-05	1.92E-05	1.63E-05
5610	4.48E-05	3.11E-05	1.93E-05	1.54E-05
5640	4.48E-05	3.12E-05	1.90E-05	1.67E-05
5670	4.49E-	3.13E-05	1.91E-05	1.63E-05
5700	4.49E-0	3.10E-05	(1.90E-05)	1.59E-05
5730	4.49E-05	3.10E-05	(1.89E-05)	1.54E-05
5760	4.45E-05	3.07E-05	(1.89E-05)	1.53E-05
5790	4.45E-05	3.06E-05	(1.88E-05)	1.56E-05
5820	(4.43E-05)	3.01E-05	(1.88E-05)	1.52E-05
5850	(4.42E-05)	(3.00E-05)	(1.87E-05)	1.47E-05
5880	(4.40E-05)	(3.00E-05)	(1.86E-05)	1.49E-05
5910	(4.39E-05)	(2.99E-05)	(1.86E-05)	(1.48E-05)
5940	(4.37E-05)	(2.98E-05)	(1.85E-05)	(1.48E-05)
5970	(4.36E-05)	(2.97E-05)	(1.85E-05)	(1.48E-05)
6000	(4.35E-05)	(2.96E-05)	(1.84E-05)	(1.47E-05)
FIRST DATA ALT	120	90	90	90
LAST DATA ALT	5790	5820	5670	5880

FLIGHT NO. C-469
EQUIVALENT ATTENUATION LENGTH

(JOB 4068 DATE 05/19/80)
DATE 82278 FLIGHT NO. C-469 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	1.29E 03	2.75E 03	4.98E 03	6.92E 03
300	1.37E 03	3.10E 03	5.14E 03	7.03E 03
600	1.54E 03	3.22E 03	5.45E 03	5.24E 03
900	1.64E 03	3.34E 03	5.31E 03	5.66E 03
1200	2.09E 03	3.18E 03	5.20E 03	5.47E 03
1500	2.50E 03	3.73E 03	6.04E 03	6.44E 03
1800	2.86E 03	4.05E 03	5.28E 03	7.12E 03
2100	3.25E 03	4.59E 03	7.03E 03	7.91E 03
2400	3.62E 03	5.11E 03	7.84E 03	8.68E 03
2700	3.98E 03	5.61E 03	8.60E 03	9.53E 03
3000	4.32E 03	6.10E 03	9.35E 03	1.03E 04
3300	4.65E 03	6.56E 03	1.01E 04	1.11E 04
3600	4.97E 03	7.02E 03	1.08E 04	1.19E 04
3900	5.28E 03	7.46E 03	1.15E 04	1.27E 04
4200	5.58E 03	7.88E 03	1.22E 04	1.35E 04
4500	5.87E 03	8.29E 03	1.28E 04	1.42E 04
4800	6.15E 03	8.69E 03	1.35E 04	1.50E 04
5100	6.42E 03	9.08E 03	1.41E 04	1.57E 04
5400	6.69E 03	9.45E 03	1.47E 04	1.64E 04
5700	6.94E 03	9.81E 03	1.52E 04	1.70E 04
6000	7.19E 03	1.02E 04	1.58E 04	1.77E 04

FLIGHT NO. C-469
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.04E-01	9.08E-01	9.43E-01	9.58E-01
600	6.77E-01	8.30E-01	8.95E-01	9.08E-01
900	5.77E-01	7.64E-01	8.44E-01	8.53E-01
1200	5.63E-01	6.86E-01	7.94E-01	8.03E-01
1500	5.49E-01	6.69E-01	7.80E-01	7.92E-01
1800	5.33E-01	6.41E-01	7.51E-01	7.77E-01
2100	5.25E-01	6.33E-01	7.42E-01	7.67E-01
2400	5.16E-01	6.25E-01	7.36E-01	7.58E-01
2700	5.07E-01	6.18E-01	7.31E-01	7.53E-01
3000	4.99E-01	6.11E-01	7.26E-01	7.48E-01
3300	4.92E-01	6.05E-01	7.21E-01	7.44E-01
3600	4.85E-01	5.99E-01	7.17E-01	7.40E-01
3900	4.78E-01	5.93E-01	7.13E-01	7.36E-01
4200	4.71E-01	5.87E-01	7.09E-01	7.32E-01
4500	4.65E-01	5.81E-01	7.04E-01	7.29E-01
4800	4.58E-01	5.76E-01	7.00E-01	7.26E-01
5100	4.52E-01	5.70E-01	6.96E-01	7.22E-01
5400	4.46E-01	5.65E-01	6.92E-01	7.19E-01
5700	4.40E-01	5.59E-01	6.88E-01	7.16E-01
6000	4.34E-01	5.54E-01	6.84E-01	7.12E-01

FLIGHT C-471 - 11 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0739	0812	0.55	64.0	-	59.0	0	540
4,5	0818	0849	0.50	58 4	-	54.0	0	540

Flight Description. Flight C-471 was a morning flight with take off at 0706 and landing at 0935 GMT. This flight was first of three data packages collected over the same track on this date. There were overcast altostratus clouds which became broken near the end of the flight. The approximate east to west Birkhof track in southwest Germany was over plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent green fields and valleys.

In-Flight Notes. The in-flight observer noted at 073^{5} GMT at 900 meters MSL and 300 meters (1000 feet) above the ground that there was an overcast deck of altostratus at 1500 meters (5000 feet) and slant range visibility of 24 kilometers (15 miles). The overcast prevented multi levels over the high ground of the Swabische Alps. Dual 2+2 were possible if done in one filter legs in the western half of the track At 0745 GMT at 1350 meters MSL the overcast remained unchanged and there were clouds on the horizon. Slant range was 48 kilometers (30 miles) with light haze At 0819 GMT at 900 meters MSL cloud cover was unchanged but the slant range had decreased to 24 to 32 kilometers (15 to 20 miles). The overcast was slightly less uniform. At 0830 GMT and 1350 meters MSL the altostratus deck was broken variable overcast with bases at 1500 meters (5000 feet) and slant range of 40 kilometers (25 miles) in light haze. The flight broke into a hole midway through the 2nd filter The broken variable overcast layer was starting to break up from the north.

Local Weather Notes. Freudenstad, 52.9 kilometers west of the track center, reported 3/8 to 2/8 stratocumulus at 900 meters (3000 feet) with 25 to 28 kilometers visibility. At the 0900 GMT observation there was also 3/8 altocumulus at 3000 meters (10,000 feet).

Spaichinger, 27.8 kilometers southwest of the track center, observed 4/8 to 5/8 stratocumulus at 900 to 1050 meters (3000 to 3500 feet) and 5/8 to 7/8 altocumulus at 3000 meters (10,000 feet). Visibility was 30 to 35 kilometers.

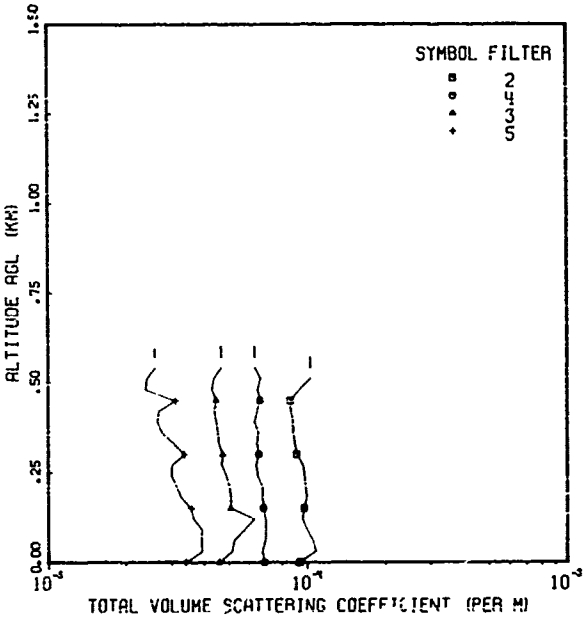
Ulm, 68.2 kilometers eastnortheast of the track center, reported 5/8 stratocumulus at 1290 meters (4300 feet), 7/8 altocumulus at 3000 meters (10,000 feet) and visibility 28 to 35 kilometers in the early morning. By 0900 GMT there were 3/8 cumulus and stratocumulus at 1020 meters (3400 feet) and 40 kilometers visibility.

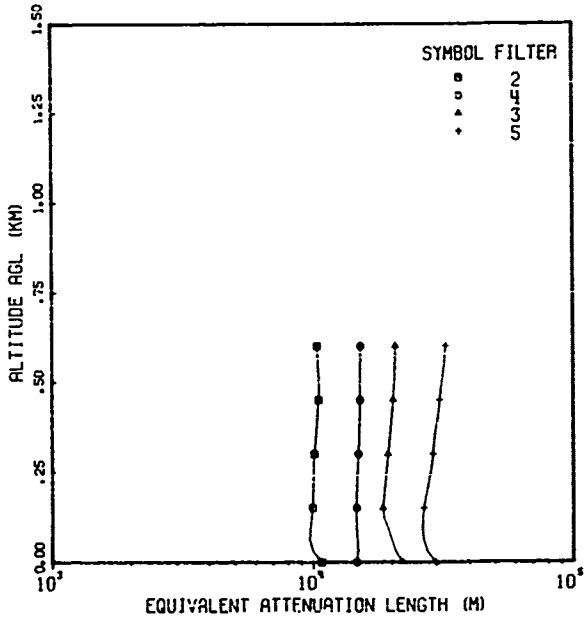
The radiosonde station at Neuchatel was 225 kilometers southwest of the track and in an airflow that was parallel to the track. The sounding at 1200 GMT was colder at all levels above 700 millibars and at some levels below than it was at 0000 GMT. Also it was more moist above 550 millibars than it had been.

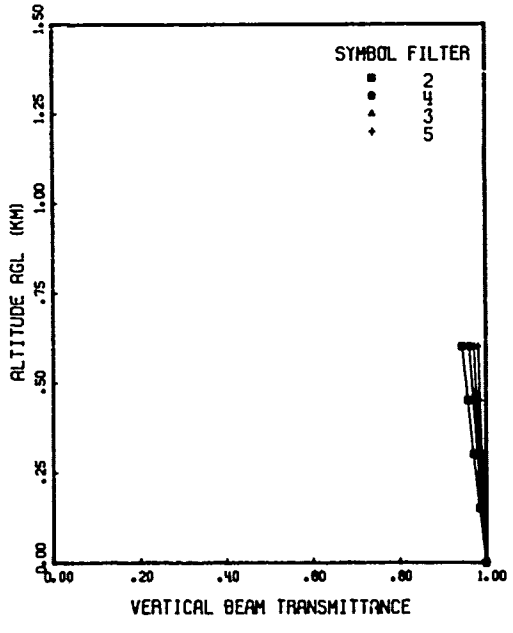
Synoptic Remarks. The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front. The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds At 1200 GMT there was ridging from eastern Spain to central Poland. The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France.

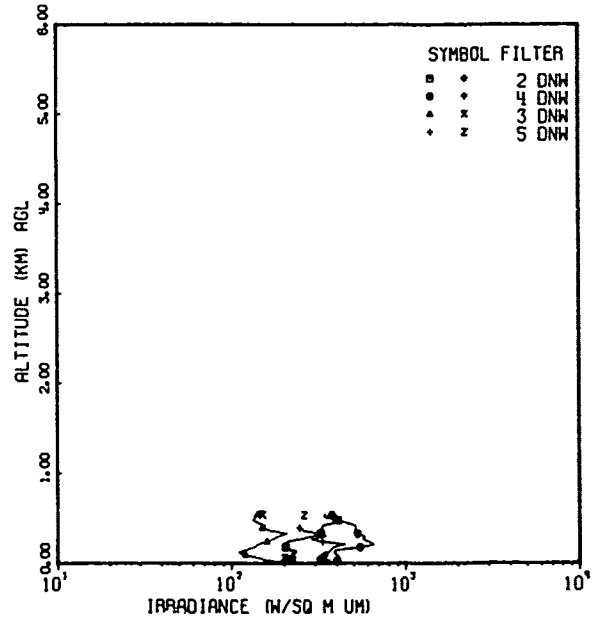
FLIGHT NO. C-471

BIRKHOF









FLIGHT NO. C-471
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5191 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-471 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	9.31E-05	6.81E-05	5.56E-05	3.40E-05
30	1.08E-04	6.68E-05	5.13E-05	3.92E-05
60	1.05E-04	6.90E-05	5.32E-05	3.88E-05
90	9.94E-05	6.92E-05	5.75E-05	3.91E-05
120	9.55E-05	6.86E-05	5.25E-05	3.63E-05
150	9.69E-05	6.76E-05	5.06E-05	3.56E-05
180	9.96E-05	6.71E-05	5.07E-05	3.25E-05
210	9.83E-05	6.70E-05	5.00E-05	3.13E-05
240	9.74E-05	6.42E-05	4.86E-05	2.99E-05
270	9.61E-05	6.33E-05	4.66E-05	3.01E-05
300	9.09E-05	6.49E-05	4.71E-05	3.36E-05
330	8.91E-05	6.38E-05	4.55E-05	3.06E-05
360	8.80E-05	6.46E-05	4.51E-05	2.75E-05
390	8.78E-05	6.25E-05	4.44E-05	2.63E-05
420	8.63E-05	6.42E-05	4.37E-05	2.67E-05
450	8.60E-05	6.59E-05	4.45E-05	3.11E-05
480	9.34E-05	6.43E-05	4.29E-05	2.37E-05
510	1.03E-04	6.61E-05	4.36E-05	2.40E-05
540	(1.03E-04)	6.29E-05	4.68E-05	2.58E-05
570	(1.03E-04)	(6.28E-05)	(4.67E-05)	(2.58E-05)
600	(1.03E-04)	(6.26E-05)	(4.65E-05)	(2.57E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	510	540	540	540

FLIGHT NO. C-471
EQUIVALENT ATTENUATION LENGTH

(JOB 5191 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-471 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	1.07E 04	1.47E 04	2.19E 04	2.94E 04
300	1.01E 04	1.49E 04	1.94E 04	2.88E 04
600	1.04E 04	1.53E 04	2.07E 04	3.24E 04

FLIGHT NO. C-471
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.71E-01	9.80E-01	9.85E-01	9.90E-01
600	9.44E-01	9.61E-01	9.71E-01	9.82E-01

FLIGHT C-472 - 11 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1241	1342	1.00	46.9	-	53.3	0	5280
4,5	1400	1457	0.95	55.4	-	63.6	0	5250

Flight Description. Flight C-472 was an afternoon flight with take off at 1151 and tape ending about 1500 GMT This flight was the second of three data packages collected over the same track on this date. There were broken to overcast cumulus clouds during the flight. The approximate east to west Birkhof flight track in southwest Germany was over plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent green fields and valleys

In-Flight Notes. The in-flight observer noted that the heavy stratocumulus and cumulus field prevented scanner data The morning stratocumulus began dissipating about noon, but cumulus forming over the Swabische Alb in strong westerly flow prevented continuation of the clearing process. About 1230 GMT at 900 meters MSL there were broken cumulus at 1500 meters (5000 feet) and light haze. At 2400 meters MSL the tops of the broken stratocumulus and cumulus were 1800 meters (6000 feet) with scattered altocumulus and altostratus at 3000 meters (10,000 feet) slant range was good in light haze At 4500 meters MSL tops of the broken to overcast layer were 1800 meters (6000 feet). At 6000 meters MSL tops of the broken to overcast layer were 2400 meters (8000 feet). On the second ascent cloud bases were 1650 meters (5500 feet). Cumulus and lenticular clouds moved rapidly into the entire area. The flight was in and out of the clouds from 1890 to 2400 meters and cumulus were beginning to pop over the entire track. Tops of cumulus were now about 3300 meters (11,000 feet) and top of the low level haze was 1800 meters (6000 feet). It was exceptionally clear above 1800 meters (6000 feet). Cloud bases over ALB are at 1500 meters MSL (5000 feet). Minimum altitude over ALB is 1200 meters (4000 feet) and dual 2+2 over ALB is not possible. At 1400 GMT and 3000 meters MSL there was scattered altostratus to the north, broken variable overcast cumulus and very light haze with exceptional slant range visibility. On the second descent from 3000 to 2850 meters in and out of patches of wisps - remainder of cloud bases were at 1590 meters (5300 feet).

Local Weather Notes. Freudenstad, 52.9 kilometers west of the track center, reported 5/8 stratocumulus at 780 to 900 meters (2600 to 3000 feet) with visibility 40 kilometers and some light rain.

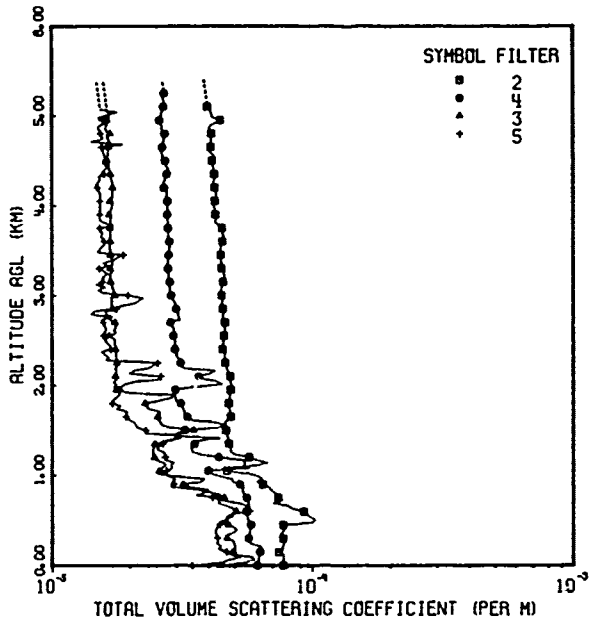
Spaichinger, 27.8 kilometers southwest of the track center, recorded 7/8 to 5/8 stratocumulus at 900 to 780 meters (3000 to 2600 feet). Visibility was 60 kilometers.

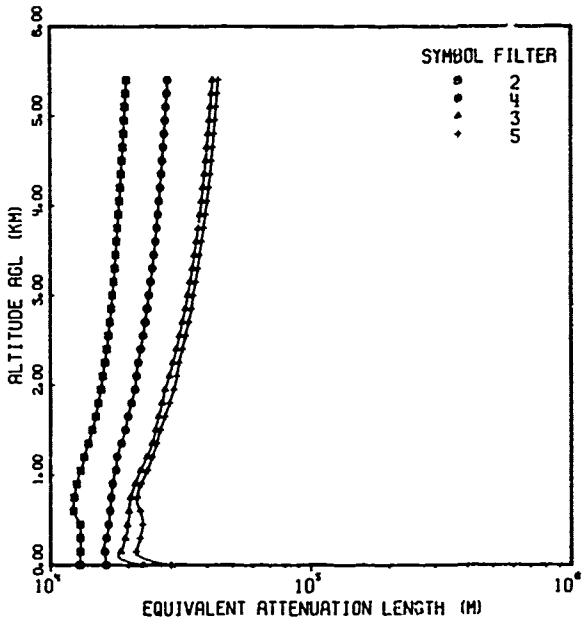
Ulm, 68.2 kilometers eastnortheast of the track center, recorded 2/8 to 5/8 cumulus at 1080 meters (3600 feet) and 5/8 to 7/8 altocumulus at 1350 to 1380 meters (4500 to 4600 feet). Visibility was 45 to 50 kilometers.

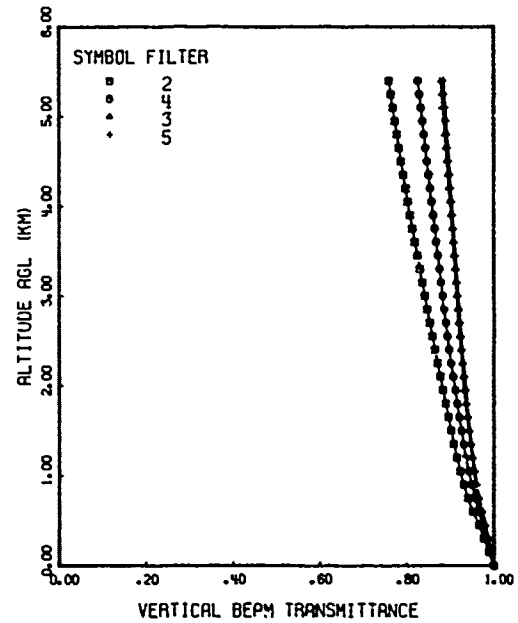
The radiosonde station at Neuchatel was 225 kilometers southwest of the track and in an airflow that was parallel to the track. The sounding at 1200 GMT was colder at all levels above 700 millibars and at some levels below than it had been at 0000 GMT. Also it was more moist above 550 millibars than it had been.

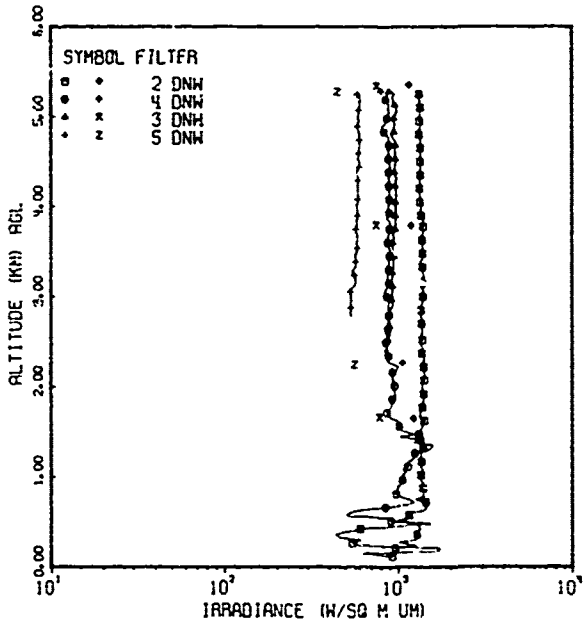
Synoptic Remarks. The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds. At 1200 GMT there was ridging from eastern Spain to central Poland. The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France.

FLIGHT NO. 472
BIRKHOF









FLIGHT NO. C-472
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5190 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-472 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	7.71E-05	6.12E-05	4.41E-05	3.45E-05
30	7.71E-05	6.15E-05	5.41E-05	4.47E-05
60	7.71E-05	6.18E-05	5.96E-05	4.74E-05
90	7.71E-05	6.21E-05	5.84E-05	5.26E-05
120	7.71E-05	6.24E-05	4.90E-05	4.85E-05
150	7.40E-05	6.27E-05	4.74E-05	4.65E-05
180	7.67E-05	6.30E-05	5.01E-05	4.34E-05
210	7.68E-05	6.33E-05	5.02E-05	4.43E-05
240	7.74E-05	5.77E-05	4.95E-05	4.27E-05
270	7.78E-05	5.68E-05	4.93E-05	4.31E-05
300	7.70E-05	5.67E-05	4.68E-05	4.30E-05
330	7.68E-05	5.71E-05	4.65E-05	4.25E-05
360	7.59E-05	5.71E-05	4.91E-05	4.22E-05
390	7.76E-05	5.76E-05	5.10E-05	4.22E-05
420	7.74E-05	5.74E-05	4.97E-05	4.30E-05
450	7.70E-05	5.79E-05	4.73E-05	4.39E-05
480	1.00E-04	5.68E-05	4.43E-05	4.59E-05
510	1.02E-04	5.64E-05	4.68E-05	4.69E-05
540	9.79E-05	5.61E-05	4.88E-05	4.68E-05
570	9.49E-05	5.58E-05	4.94E-05	4.90E-05
600	9.25E-05	5.56E-05	5.07E-05	5.73E-05
630	8.30E-05	5.46E-05	4.93E-05	5.59E-05
660	8.04E-05	5.48E-05	4.69E-05	5.66E-05
690	7.97E-05	5.67E-05	4.33E-05	5.20E-05
720	7.64E-05	5.64E-05	4.37E-05	4.45E-05
750	7.37E-05	5.57E-05	4.56E-05	4.11E-05
780	7.42E-05	5.47E-05	3.57E-05	4.41E-05
810	7.11E-05	5.39E-05	3.87E-05	4.01E-05
840	6.90E-05	5.37E-05	3.97E-05	3.63E-05
870	6.80E-05	5.40E-05	3.39E-05	2.85E-05
900	6.43E-05	5.25E-05	3.18E-05	2.92E-05
930	6.11E-05	4.93E-05	3.74E-05	2.89E-05
960	6.38E-05	4.89E-05	3.83E-05	2.96E-05
990	6.18E-05	4.41E-05	2.96E-05	2.80E-05
1020	5.68E-05	4.04E-05	2.56E-05	2.73E-05
1050	4.67E-05	3.96E-05	2.57E-05	2.74E-05
1080	4.44E-05	5.70E-05	2.63E-05	2.88E-05
1110	6.04E-05	5.43E-05	2.72E-05	2.84E-05
1140	6.70E-05	5.47E-05	2.63E-05	2.92E-05
1170	6.06E-05	5.45E-05	2.52E-05	2.73E-05
1200	5.70E-05	4.34E-05	2.47E-05	2.72E-05
1230	5.04E-05	3.75E-05	2.45E-05	2.69E-05
1260	4.84E-05	3.45E-05	2.44E-05	2.68E-05
1290	4.84E-05	3.43E-05	2.44E-05	2.54E-05
1320	4.82E-05	3.42E-05	2.47E-05	2.54E-05
1350	4.75E-05	3.52E-05	2.48E-05	2.65E-05
1380	4.72E-05	3.49E-05	2.80E-05	2.72E-05
1410	4.73E-05	4.38E-05	3.12E-05	2.98E-05
1440	4.68E-05	2.98E-05	2.91E-05	3.12E-05
1470	4.70E-05	3.03E-05	3.10E-05	2.30E-05
1500	4.63E-05	3.23E-05	3.48E-05	2.29E-05

FLIGHT NO. C-472
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5190 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-472 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
1530	4.61E-05	4.34E-05	2.82E-05	2.12E-05
1560	4.61E-05	4.63E-05	2.63E-05	2.09E-05
1590	4.61E-05	4.10E-05	2.60E-05	2.05E-05
1620	4.72E-05	3.31E-05	2.55E-05	1.96E-05
1650	4.84E-05	3.30E-05	2.54E-05	1.92E-05
1680	4.82E-05	3.22E-05	2.59E-05	1.92E-05
1710	4.80E-05	3.22E-05	2.58E-05	1.93E-05
1740	4.78E-05	3.17E-05	2.35E-05	1.77E-05
1770	4.73E-05	3.14E-05	2.30E-05	1.83E-05
1800	4.76E-05	3.11E-05	2.28E-05	1.70E-05
1830	4.77E-05	2.97E-05	2.56E-05	1.71E-05
1860	4.78E-05	2.97E-05	2.87E-05	1.76E-05
1890	4.80E-05	2.95E-05	2.91E-05	1.81E-05
1920	4.81E-05	2.96E-05	1.95E-05	1.82E-05
1950	4.83E-05	2.96E-05	1.77E-05	1.81E-05
1980	4.84E-05	3.39E-05	1.73E-05	1.85E-05
2010	4.86E-05	4.49E-05	1.76E-05	1.90E-05
2040	4.83E-05	4.30E-05	1.72E-05	2.09E-05
2070	4.80E-05	3.86E-05	1.77E-05	2.59E-05
2100	4.82E-05	3.65E-05	1.75E-05	2.62E-05
2130	4.76E-05	4.05E-05	1.76E-05	1.98E-05
2160	4.71E-05	4.20E-05	1.77E-05	2.06E-05
2190	4.67E-05	3.23E-05	1.75E-05	2.33E-05
2220	4.65E-05	3.06E-05	1.78E-05	2.43E-05
2250	4.61E-05	3.11E-05	1.77E-05	2.54E-05
2280	4.58E-05	3.16E-05	1.77E-05	1.62E-05
2310	4.59E-05	3.01E-05	1.76E-05	1.65E-05
2340	4.58E-05	2.99E-05	1.76E-05	1.60E-05
2370	4.62E-05	2.98E-05	1.75E-05	1.55E-05
2400	4.50E-05	2.95E-05	1.75E-05	1.69E-05
2430	4.51E-05	2.96E-05	1.75E-05	1.68E-05
2460	4.53E-05	2.95E-05	1.74E-05	1.64E-05
2490	4.54E-05	2.96E-05	1.74E-05	1.60E-05
2520	4.55E-05	2.94E-05	1.73E-05	1.62E-05
2550	4.56E-05	2.91E-05	1.66E-05	1.58E-05
2580	4.57E-0	2.92E-05	1.75E-05	1.60E-05
2610	4.59E-05	2.92E-05	1.73E-05	1.61E-05
2640	4.60E-05	2.91E-05	1.75E-05	1.61E-05
2670	4.61E-05	2.86E-05	1.77E-05	1.59E-05
2700	4.60E-05	2.84E-05	1.74E-05	1.58E-05
2730	4.59E-05	3.09E-05	1.67E-05	1.56E-05
2760	4.52E-05	3.06E-05	1.66E-05	1.70E-05
2790	4.53E-05	3.04E-05	1.41E-05	1.62E-05
2820	4.54E-05	3.01E-05	1.45E-05	1.61E-05
2850	4.51E-05	2.98E-05	1.70E-05	1.77E-05
2880	4.48E-05	2.96E-05	1.71E-05	1.82E-05
2910	4.48E-05	2.96E-05	1.69E-05	2.07E-05
2940	4.50E-05	2.92E-05	1.70E-05	2.15E-05
2970	4.50E-05	2.88E-05	1.69E-05	2.23E-05
3000	4.47E-05	2.85E-05	1.74E-05	1.95E-05

FLIGHT NO. C-472
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5190 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-472 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.42E-05	2.84E-05	1.73E-05	1.57E-05
3060	4.45E-05	2.83E-05	1.72E-05	1.51E-05
3090	4.48E-05	2.82E-05	1.70E-05	1.60E-05
3120	4.50E-05	2.82E-05	1.69E-05	1.48E-05
3150	4.53E-05	2.82E-05	1.68E-05	1.57E-05
3180	4.55E-05	2.79E-05	1.67E-05	1.57E-05
3210	4.58E-05	2.79E-05	1.68E-05	1.58E-05
3240	4.56E-05	2.78E-05	1.66E-05	1.65E-05
3270	4.51E-05	2.80E-05	1.71E-05	1.58E-05
3300	4.46E-05	2.78E-05	1.67E-05	1.52E-05
3330	4.45E-05	2.78E-05	1.70E-05	1.64E-05
3360	4.47E-05	2.78E-05	1.71E-05	1.58E-05
3390	4.45E-05	2.78E-05	1.70E-05	1.71E-05
3420	4.44E-05	2.79E-05	1.69E-05	1.77E-05
3450	4.43E-05	2.80E-05	1.68E-05	1.88E-05
3480	4.44E-05	2.81E-05	1.69E-05	1.50E-05
3510	4.42E-05	2.82E-05	1.67E-05	1.53E-05
3540	4.44E-05	2.83E-05	1.67E-05	1.55E-05
3570	4.47E-05	2.80E-05	1.67E-05	1.60E-05
3600	4.50E-05	2.82E-05	1.67E-05	1.59E-05
3630	4.53E-05	2.79E-05	1.67E-05	1.57E-05
3660	4.56E-05	2.79E-05	1.67E-05	1.54E-05
3690	4.50E-05	2.79E-05	1.67E-05	1.56E-05
3720	4.51E-05	2.79E-05	1.67E-05	1.55E-05
3750	4.48E-05	2.78E-05	1.67E-05	1.53E-05
3780	4.37E-05	2.78E-05	1.70E-05	1.72E-05
3810	4.22E-05	2.78E-05	1.68E-05	1.59E-05
3840	4.24E-05	2.77E-05	1.68E-05	1.53E-05
3870	4.22E-05	2.76E-05	1.68E-05	1.53E-05
3900	4.23E-05	2.76E-05	1.66E-05	1.53E-05
3930	4.20E-05	2.77E-05	1.67E-05	1.53E-05
3960	4.21E-05	2.77E-05	1.69E-05	1.53E-05
3990	4.16E-05	2.77E-05	1.71E-05	1.53E-05
4020	4.19E-05	2.77E-05	1.70E-05	1.53E-05
4050	4.21E-05	2.77E-05	1.67E-05	1.53E-05
4080	4.23E-05	2.77E-05	1.70E-05	1.53E-05
4110	4.25E-05	2.74E-05	1.71E-05	1.53E-05
4140	4.27E-05	2.76E-05	1.71E-05	1.53E-05
4170	4.22E-05	2.75E-05	1.71E-05	1.51E-05
4200	4.20E-05	2.69E-05	1.71E-05	1.50E-05
4230	4.16E-05	2.67E-05	1.71E-05	1.48E-05
4260	4.16E-05	2.69E-05	1.70E-05	1.51E-05
4290	4.18E-05	2.71E-05	1.69E-05	1.53E-05
4320	4.21E-05	2.73E-05	1.68E-05	1.51E-05
4350	4.18E-05	2.76E-05	1.67E-05	1.59E-05
4380	4.17E-05	2.78E-05	1.67E-05	1.57E-05
4410	4.15E-05	2.78E-05	1.66E-05	1.61E-05
4440	4.14E-05	2.75E-05	1.65E-05	1.63E-05
4470	4.08E-05	2.71E-05	1.64E-05	1.57E-05
4500	4.11E-05	2.72E-05	1.63E-05	1.61E-05

FLIGHT NO. C-472
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 5190 DATE 05/16/80
DATE 91178 FLIGHT NO. C-472 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.12E-05	2.67E-05	1.63E-05	1.60E-05
4560	4.17E-05	2.66E-05	1.64E-05	1.59E-05
4590	4.05E-05	2.64E-05	1.64E-05	1.58E-05
4620	4.05E-05	2.63E-05	1.55E-05	1.57E-05
4650	4.06E-05	2.65E-05	1.55E-05	1.56E-05
4680	4.06E-05	2.66E-05	1.63E-05	1.87E-05
4710	4.07E-05	2.68E-05	1.67E-05	1.42E-05
4740	4.07E-05	2.69E-05	1.54E-05	1.57E-05
4770	4.08E-05	2.71E-05	1.63E-05	1.56E-05
4800	4.08E-05	2.71E-05	1.67E-05	1.54E-05
4830	4.04E-05	2.66E-05	1.62E-05	1.52E-05
4860	4.00E-05	2.63E-05	1.60E-05	1.51E-05
4890	4.05E-05	2.64E-05	1.62E-05	1.52E-05
4920	4.23E-05	2.60E-05	1.62E-05	1.62E-05
4950	4.42E-05	2.59E-05	1.63E-05	1.57E-05
4980	4.12E-05	2.61E-05	1.66E-05	1.52E-05
5010	4.09E-05	2.62E-05	1.64E-05	1.65E-05
5040	4.06E-05	2.64E-05	(1.63E-05)	1.77E-05
5070	4.02E-05	2.66E-05	(1.63E-05)	1.54E-05
5100	3.94E-05	2.68E-05	(1.62E-05)	(1.53E-05)
5130	3.95E-05	2.71E-05	(1.62E-05)	(1.53E-05)
5160	3.93E-05	2.69E-05	(1.61E-05)	(1.52E-05)
5190	(3.92E-05)	2.67E-05	(1.61E-05)	(1.52E-05)
5220	(3.90E-05)	2.66E-05	(1.60E-05)	(1.51E-05)
5250	(3.89E-05)	2.69E-05	(1.60E-05)	(1.51E-05)
5280	(3.88E-05)	(2.68E-05)	(1.59E-05)	(1.50E-05)
5310	(3.87E-05)	(2.68E-05)	(1.59E-05)	(1.50E-05)
5340	(3.86E-05)	(2.67E-05)	(1.58E-05)	(1.49E-05)
5370	(3.84E-05)	(2.66E-05)	(1.58E-05)	(1.49E-05)
5400	(3.83E-05)	(2.65E-05)	(1.57E-05)	(1.48E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	5160	5250	5010	5070

FLIGHT NO. C-472
EQUIVALENT ATTENUATION LENGTH

JOB 5190 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-472 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	1.30E 04	1.63E 04	2.27E 04	2.90E 04
300	1.30E 04	1.64E 04	1.94E 04	2.21E 04
600	1.22E 04	1.70E 04	2.01E 04	2.21E 04
900	1.26E 04	1.74E 04	2.12E 04	2.23E 04
1200	1.35E 04	1.80E 04	2.35E 04	2.45E 04
1500	1.45E 04	1.94E 04	2.53E 04	2.64E 04
1800	1.53E 04	2.05E 04	2.68E 04	2.87E 04
2100	1.59E 04	2.14E 04	2.86E 04	3.06E 04
2400	1.64E 04	2.22E 04	3.05E 04	3.22E 04
2700	1.69E 04	2.31E 04	3.22E 04	3.40E 04
3000	1.73E 04	2.39E 04	3.38E 04	3.53E 04
3300	1.77E 04	2.46E 04	3.51E 04	3.68E 04
3600	1.80E 04	2.53E 04	3.64E 04	3.81E 04
3900	1.83E 04	2.58E 04	3.75E 04	3.93E 04
4200	1.86E 04	2.64E 04	3.85E 04	4.04E 04
4500	1.89E 04	2.69E 04	3.94E 04	4.15E 04
4800	1.92E 04	2.74E 04	4.03E 04	4.24E 04
5100	1.94E 04	2.78E 04	4.12E 04	4.32E 04
5400	1.97E 04	2.82E 04	4.20E 04	4.41E 04

FLIGHT NO. C-472
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.77E-01	9.82E-01	9.85E-01	9.87E-01
600	9.52E-01	9.65E-01	9.71E-01	9.73E-01
900	9.31E-01	9.49E-01	9.58E-01	9.60E-01
1200	9.15E-01	9.36E-01	9.50E-01	9.52E-01
1500	9.02E-01	9.26E-01	9.42E-01	9.45E-01
1800	8.89E-01	9.16E-01	9.35E-01	9.39E-01
2100	8.76E-01	9.07E-01	9.29E-01	9.34E-01
2400	8.64E-01	8.98E-01	9.24E-01	9.28E-01
2700	8.52E-01	8.90E-01	9.20E-01	9.24E-01
3000	8.41E-01	8.82E-01	9.15E-01	9.19E-01
3300	8.30E-01	8.74E-01	9.10E-01	9.14E-01
3600	8.19E-01	8.67E-01	9.06E-01	9.10E-01
3900	8.08E-01	8.60E-01	9.01E-01	9.05E-01
4200	7.98E-01	8.53E-01	8.97E-01	9.01E-01
4500	7.88E-01	8.46E-01	8.92E-01	8.97E-01
4800	7.78E-01	8.39E-01	8.88E-01	8.93E-01
5100	7.69E-01	8.33E-01	8.83E-01	8.89E-01
5400	7.60E-01	8.26E-01	8.79E-01	8.85E-01

FLIGHT C-473 - 11 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1513	1617	1.07	65.8	-	76.3	270	870
4,5	1548	1623	0.58	71 5	-	77.2	0	840

Flight Description. Flight C-473 was an afternoon flight with tape beginning about 1510 and landing at 1641 GMT. This flight was the third of three data packages collected over the same track on this date. There were broken to overcast stratocumulus and cumulus clouds during the flight Dual 2+2 were conducted under the clouds. The approximate east to west Birkhof track in southwest Germany was over plateau surrounded by forest and some small villages Typical terrain features were forest cover with intermittent green fields and valleys.

In-Flight Notes. The in-flight observer noted at 1510 GMT at 300 meters (1000 feet) broken variable overcast stratocumulus and cumulus clouds; horizon cloudy and slant range 40 kilometers (25 miles). Tried dual 2+2 under variable overcast and first run was very good. At 1530 GMT at 1650 meters (5500 feet) the clouds overhead were much more variable, scattered to overcast, horizon was cloudy and slant range was 40 kilometers (25 miles). In midst of the first filter broke out into bright sunshine and blue sky to finish filter Second filter was under the overcast At 1545 GMT at 300 meters clouds were broken variable overcast and flight was under the overcast most of the run, end of run looked at blue sky, sun was at a low angle At 1605 GMT at 1650 meters there were broken variable overcast clouds and the slant range was 24 kilometers (15 miles) in light haze Flight was under dark cloud with clear break to north and patches of sunshine were widely scattered Rerun of first filter with haze somewhat denser.

Local Weather Notes. Freudenstad, 52.9 kilometers west of the track center, reported 5/8 stratocumulus at 780 meters (2600 feet) 7/8 altocumulus at 2400 meters (8000 feet) and 40 kilometers visibility with light rain at 1500 GMT.

Spaichinger, 27.8 kilometers southwest of track center, recorded 6/8 to 5/8 stratocumulus at 780 meters (2600 feet) with 50 kilometers visibility.

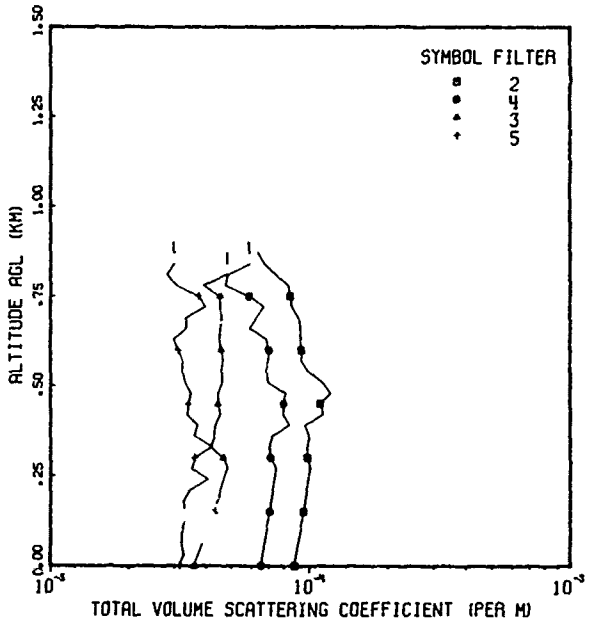
Ulm, 68.2 kilometers eastnortheast of track center, reported 3/8 cumulus and stratocumulus at 1080 meters (3600 feet), 4/8 altocumulus at 1380 to 1350 meters (4600 to 4500 feet), 5/8 high broken cirrus with 55 kilometers visibility.

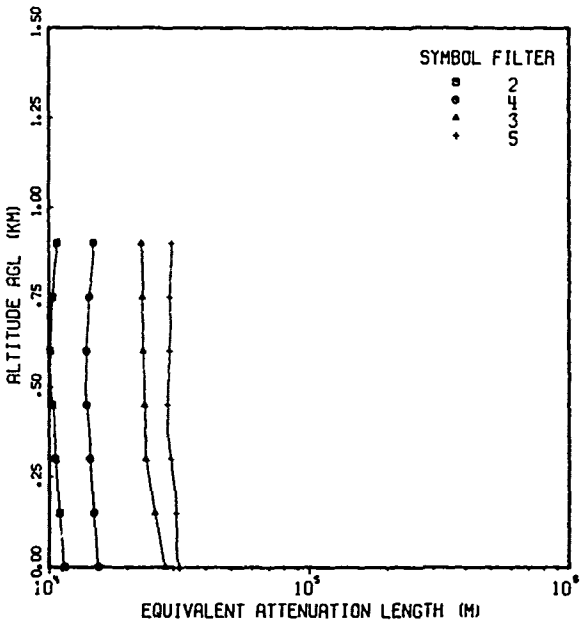
The radiosonde station at Neuchatel was 225 kilometers southwest of the track and in an airflow that was parallel to the track. The sounding at 1200 GMT was colder at all levels above 700 millibars and at some levels below than it had been at 0000 GMT. Also it was more moist above 500 millibars than it had been.

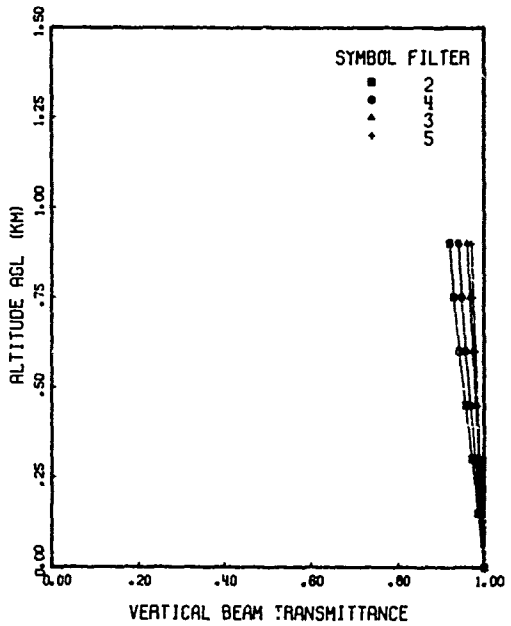
Synoptic Remarks. The surface chart for 0000 GMT showed that from a low in the Gulf of Bothnia an occluded front extended southsoutheast and then as a cold front passed through the Baltic and then westward along 55°N to a wave near Belfast and thence southwest into the Atlantic. At 1200 GMT there was a cold front with waves, part of a more extensive system, that extended from northwestern Russia southward to and through northern Poland and then west through Berlin and Hannover and southwest through France to the Atlantic. The track was in westerly flow in advance of the front The 500 millibar chart for 0000 GMT showed weak ridging from southern France northeastward to western Poland. There were moderate westerly winds. At 1200 GMT there was ridging from eastern Spain to central Poland The track continued with moderate westerly winds. The air mass was modified maritime polar. The satellite map for 1309 GMT showed the front north of the track with clouds. It was clear over Italy, Sicily and southern France

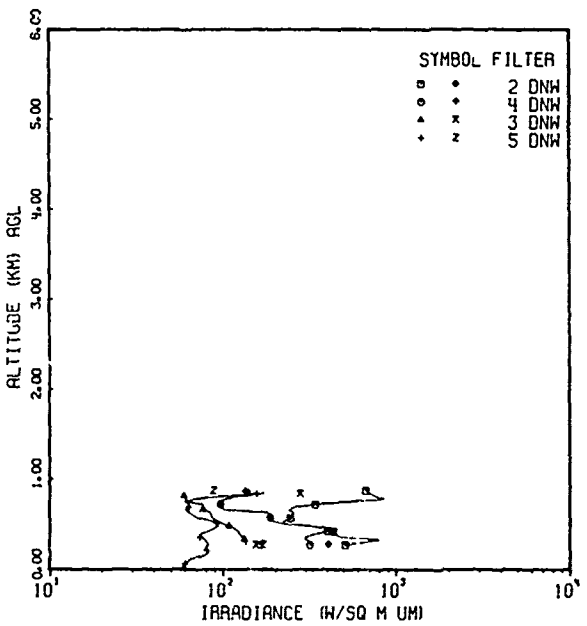
FLIGHT NO. C-473

BIRKHOF









FLIGHT NO. C-473
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5189 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-473 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	8.75E-05	6.50E-05	3.59E-05	3.15E-05
30	8.89E-05	6.60E-05	3.73E-05	3.29E-05
60	9.04E-05	6.70E-05	3.86E-05	3.21E-05
90	9.18E-05	6.80E-05	4.00E-05	3.21E-05
120	9.33E-05	6.91E-05	4.14E-05	3.30E-05
150	9.47E-05	7.01E-05	4.27E-05	3.32E-05
180	9.61E-05	7.11E-05	4.41E-05	3.27E-05
210	9.76E-05	7.21E-05	4.55E-05	3.46E-05
240	9.90E-05	7.31E-05	4.69E-05	4.07E-05
270	1.00E-04	7.41E-05	4.82E-05	3.51E-05
300	9.80E-05	7.08E-05	4.65E-05	3.62E-05
330	9.80E-05	7.00E-05	4.16E-05	4.22E-05
360	9.98E-05	7.17E-05	4.30E-05	3.60E-05
390	9.61E-05	8.37E-05	4.32E-05	3.70E-05
420	1.12E-04	7.89E-05	4.52E-05	3.37E-05
450	1.09E-04	7.94E-05	4.44E-05	3.42E-05
480	1.20E-04	8.08E-05	4.43E-05	3.49E-05
510	1.11E-04	6.89E-05	4.61E-05	3.30E-05
540	9.87E-05	6.80E-05	4.56E-05	3.22E-05
570	9.25E-05	6.91E-05	4.63E-05	3.24E-05
600	9.30E-05	6.96E-05	4.56E-05	3.11E-05
630	9.21E-05	6.82E-05	4.49E-05	2.99E-05
660	9.17E-05	5.87E-05	4.51E-05	3.34E-05
690	9.07E-05	6.29E-05	4.59E-05	3.35E-05
720	8.54E-05	6.69E-05	4.51E-05	3.98E-05
750	8.41E-05	5.84E-05	4.52E-05	3.73E-05
780	8.25E-05	4.71E-05	3.88E-05	3.06E-05
810	7.44E-05	4.88E-05	4.82E-05	2.82E-05
840	6.69E-05	5.87E-05	(4.80E-05)	3.00E-05
870	6.31E-05	(5.85E-05)	(4.79E-05)	(2.99E-05)
900	(6.29E-05)	(5.83E-05)	(4.77E-05)	(2.99E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	870	840	810	840

FLIGHT NO. C-473
EQUIVALENT ATTENUATION LENGTH

(JOB 5189 DATE 05/16/80)
DATE 91178 FLIGHT NO. C-473 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	1.14E 04	1.54E 04	2.79E 04	3.17E 04
300	1.06E 04	1.43E 04	2.35E 04	2.94E 04
600	1.01E 04	1.39E 04	2.29E 04	2.90E 04
900	1.08E 04	1.48E 04	2.26E 04	2.96E 04

FLIGHT NO. C-473
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.72E-01	9.79E-01	9.87E-01	9.90E-01
600	9.42E-01	9.58E-01	9.74E-01	9.80E-01
900	9.20E-01	9.41E-01	9.61E-01	9.70E-01

FLIGHT C-474 - 13 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0914	1100	1 77	51 8	-	44 6	30	5490
4,5	1104	1301	1 95	44 5	44.4	49 5	0	5460

Flight Description. Flight C-474 was a midday flight spanning local apparent noon with take off at 0850 and landing at 1335 GMT. There were scattered variable broken clouds with some overcast over the east end of the track in the beginning The approximate east to west Birkhof track in southwest Germany was over plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent green fields and valleys

In-Flight Notes. The in-flight observer noted that they were working the basic track in pieces At 0915 GMT at 1050 meters (3500 feet) there was thin scattered variable thin broken altostratus at 2400 meters (8000 feet) and light to moderate haze with slant range 16 kilometers (10 miles) First low level run was at 1050 meters AGL, varied from 150 to 300 meters AGL (500 to 1000 feet) over valley on west end of track Thin altostratus was scattered over west half and overcast over east half of track. On the ascent from 1050 to 1500 meters (3500 to 5000 feet) haze was relatively uniform and the flight was below the haze top at 1500 meters (5000 feet). Cumulus were beginning to form at the haze top in all quadrants but were suppressed. Altostratus is still thin and moving to the east slowly At 1010 GMT at 4200 meters (13,000 feet) horizon had light haze and little cloud; slant range to the surface in the valley was 48 kilometers (30 miles) At 1035 at 6000 meters (20,000 feet) west half had scattered altostratus at 3000 meters (10,000 feet) and east half had thin broken altostratus at the same level with scattered cumulus below. On the descent from 6000 meters (20,000 feet) it was clear from 6000 to 4200 meters (20,000 to 14,000 feet) with a thin altostratus layer ahead which was not penetrated and thin altostratus layers from 4200 to 2700 meters (14,000 to 9000 feet). At 1130 GMT at 1500 meters (5000 feet) there was thin altostratus and the cumulus had dissipated. The altostratus was also dissipating with clouds coming in from the east and north. At 1235 GMT broken layer of altostratus at 3300 meters (11,000 feet). The altostratus moved into the area rapidly from the north Run was started over altostratus then flight was in the clear over most of the rest of the track. On the last descent passed through thin altostratus at 2400 meters (8000 feet) which was very thin in vertical depth. Top of haze layer was now 1800 meters (6000 feet) with visibility in haze less than 24 kilometers (15 miles). From 6000 meters (20,000 feet) there was a clear view of the surface all the way to the Alps and Bodensee was clear.

Local Weather Notes. Freudenstad, 52.9 kilometers west of track center, reported 1/8 cumulus at 750 meters (2500 feet), 5/8 decreasing to 1/8 altocumulus at 3000 meters (10,000 feet), and 5/8 to 1/8 high cirrus after 1200 GMT. Visibility ranged from 22 to 45 kilometers

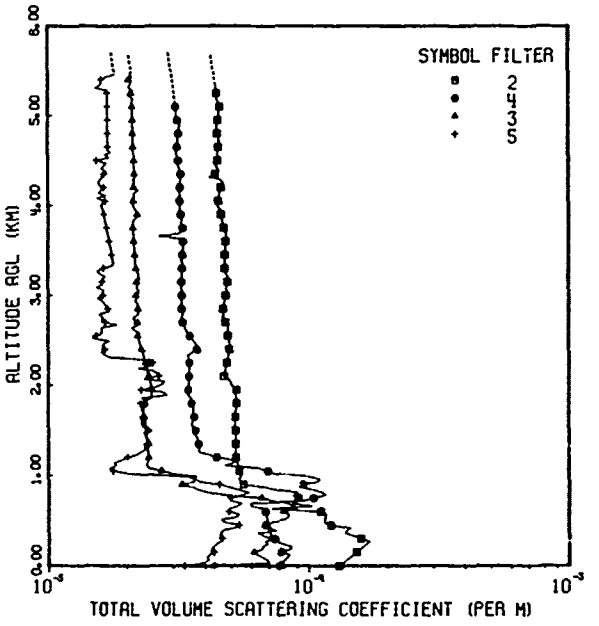
Spaichinger, 27 8 kilometers southwest of track center, recorded 1/8 cumulus at 300 to 750 meters (1000 to 2500 feet), 1/8 to 2/8 altocumulus at 3000 meters (10,000 feet) and 2/8 high cirrus The cirrus was not present after the 0900 GMT observation. Visibility ranged from 25 to 45 kilometers.

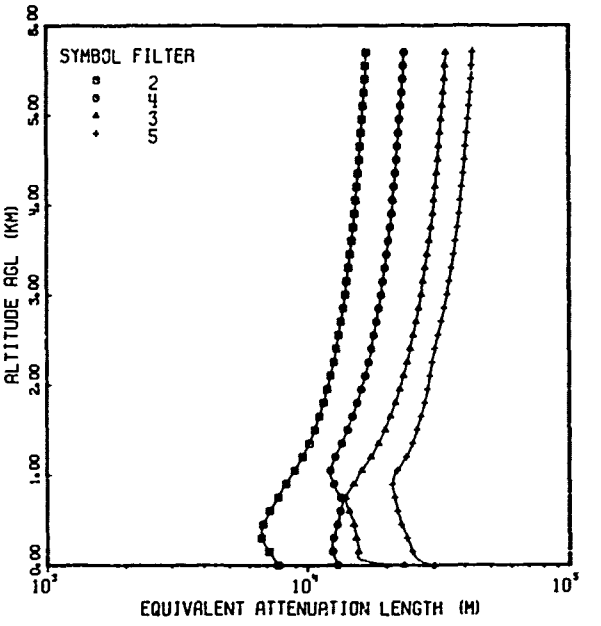
Ulm, 68 2 kilometers eastnortheast of track center, reported 1/8 cumulus at 750 meters (2500 feet), 4/8 to 5/8 altocumulus at 3000 meters (10,000 feet) and 5/8 cirrocumulus at 6900 meters (23,000 feet) becoming 7/8 cirrus at 6000 meters (20,000 feet). Visibility was 10 to 30 kilometers.

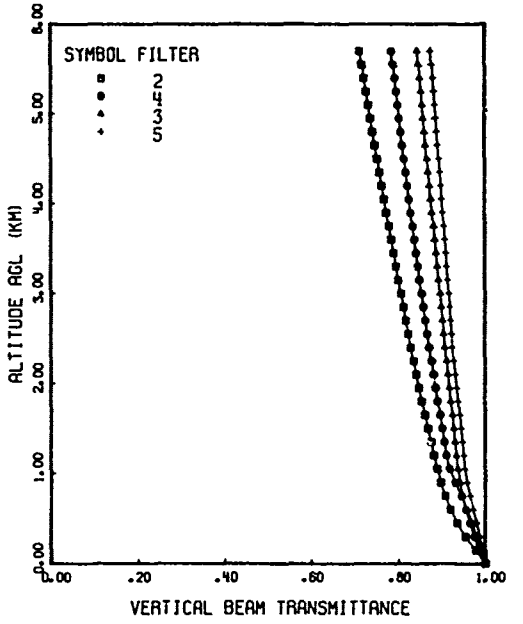
The radiosonde station at Neuchatel was 225 kilometers southwest and downstream from the track. The sounding at 1200 GMT was considerably warmer and moister than at 0000 GMT below 600 millibars except that it was drier below 770 millibars

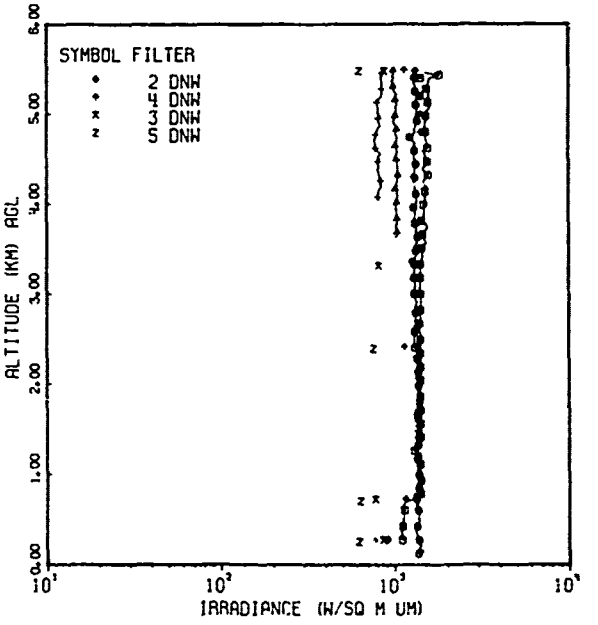
Synoptic Remarks. The surface chart for 0000 GMT showed that high pressure dominated western Europe with a 1030 millibar center located near Brest. A dissipating cold front lay across central Bulgaria, southern Yugoslavia, southern Italy and into central Spain At 1200 GMT the high pressure continued to dominate Europe with the center in northeastern France. The track was in the northeastern quadrant with light northerly winds at the surface. A weakening cold front from western Russia southwest to Sicily continued to move eastward. There was an occluded front through the Irish Sea and as a cold front southwest into the eastern Atlantic At 500 millibars at 0000 GMT there was a ridge from Spain to Norway. The track had strong (60 knots) northnorthwesterly winds. At 1200 GMT there was a slight weakening of the ridge and winds were moderate to strong northerly over the track. The air mass was modified maritime polar. The satellite map for 1309 GMT showed a clear area over France and Sicily but scattered to broken clouds over all of the rest of western Europe.

FLIGHT NO. C-474
BIRKHOF









FLIGHT NO. C-474
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5188 DATE 05/16/80)
DATE 91378 FLIGHT NO. C-474 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	5	5
0	1.30E-04	7.70E-05	4.30E-05	3.30E-05
30	1.34E-04	7.87E-05	7.00E-05	3.92E-05
60	1.39E-04	8.04E-05	6.91E-05	4.10E-05
90	1.43E-04	8.21E-05	6.65E-05	4.05E-05
120	1.48E-04	8.38E-05	6.33E-05	4.13E-05
150	1.52E-04	7.79E-05	6.11E-05	4.30E-05
180	1.57E-04	8.41E-05	6.59E-05	4.20E-05
210	1.61E-04	8.50E-05	6.60E-05	4.26E-05
240	1.65E-04	7.81E-05	6.89E-05	4.40E-05
270	1.70E-04	7.50E-05	6.80E-05	4.58E-05
300	1.58E-04	7.34E-05	7.14E-05	4.61E-05
330	1.49E-04	7.09E-05	6.68E-05	4.54E-05
360	1.37E-04	7.06E-05	6.34E-05	4.56E-05
390	1.40E-04	7.06E-05	7.45E-05	4.67E-05
420	1.45E-04	7.16E-05	6.78E-05	5.17E-05
450	1.22E-04	6.84E-05	5.75E-05	5.36E-05
480	1.14E-04	6.95E-05	7.15E-05	4.71E-05
510	1.15E-04	6.90E-05	8.05E-05	4.61E-05
540	1.16E-04	6.86E-05	8.30E-05	5.25E-05
570	1.16E-04	6.82E-05	8.33E-05	5.34E-05
600	1.11E-04	6.80E-05	7.96E-05	4.90E-05
630	7.19E-05	6.87E-05	8.87E-05	4.90E-05
660	1.02E-04	5.98E-05	8.73E-05	5.27E-05
690	8.63E-05	5.94E-05	8.22E-05	5.45E-05
720	8.85E-05	9.52E-05	7.27E-05	4.96E-05
750	9.07E-05	1.04E-04	6.58E-05	4.96E-05
780	8.68E-05	1.16E-04	4.73E-05	5.47E-05
810	9.00E-05	1.13E-04	4.18E-05	5.83E-05
840	7.52E-05	1.05E-04	3.77E-05	5.38E-05
870	6.78E-05	9.22E-05	3.58E-05	4.89E-05
900	5.56E-05	9.48E-05	3.24E-05	4.50E-05
930	5.42E-05	1.09E-04	3.60E-05	3.82E-05
960	5.36E-05	1.10E-04	3.61E-05	3.63E-05
990	5.47E-05	1.00E-04	3.70E-05	3.41E-05
1020	5.40E-05	7.43E-05	3.00E-05	2.04E-05
1050	5.38E-05	6.96E-05	2.71E-05	1.79E-05
1080	5.36E-05	6.49E-05	2.43E-05	1.72E-05
1110	5.34E-05	4.76E-05	2.38E-05	1.82E-05
1140	5.24E-05	5.12E-05	2.38E-05	1.79E-05
1170	5.27E-05	5.13E-05	2.42E-05	1.91E-05
1200	5.22E-05	4.42E-05	2.42E-05	2.01E-05
1230	5.21E-05	4.20E-05	2.41E-05	2.16E-05
1260	5.20E-05	3.78E-05	2.40E-05	2.26E-05
1290	5.21E-05	3.78E-05	2.39E-05	2.35E-05
1320	5.21E-05	3.76E-05	2.41E-05	2.34E-05
1350	5.21E-05	3.76E-05	2.41E-05	2.37E-05
1380	5.20E-05	3.76E-05	2.42E-05	2.40E-05
1410	5.20E-05	3.72E-05	2.38E-05	2.36E-05
1440	5.20E-05	3.68E-05	2.34E-05	2.37E-05
1470	5.20E-05	3.59E-05	2.37E-05	2.32E-05
1500	5.19E-05	3.65E-05	2.39E-05	2.41E-05

FLIGHT NO. C-474
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5188 DATE 05/16/80)
DATE 91378 FLIGHT NO. C-474 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	5.19E-05	3.60E-05	2.37E-05	2.33E-05
1560	5.19E-05	3.55E-05	2.36E-05	2.28E-05
1590	5.18E-05	3.56E-05	2.34E-05	2.28E-05
1620	5.18E-05	3.61E-05	2.35E-05	2.27E-05
1650	5.21E-05	3.62E-05	2.33E-05	2.30E-05
1680	5.20E-05	3.62E-05	2.31E-05	2.31E-05
1710	5.20E-05	3.58E-05	2.30E-05	2.31E-05
1740	5.26E-05	3.59E-05	2.30E-05	2.27E-05
1770	5.19E-05	3.59E-05	2.34E-05	2.37E-05
1800	5.25E-05	3.53E-05	2.35E-05	2.25E-05
1830	5.24E-05	3.54E-05	2.39E-05	2.36E-05
1860	5.24E-05	3.52E-05	2.49E-05	2.29E-05
1890	5.22E-05	3.42E-05	2.49E-05	2.84E-05
1920	5.23E-05	3.42E-05	2.49E-05	2.76E-05
1950	5.24E-05	3.43E-05	2.50E-05	2.26E-05
1980	5.11E-05	3.43E-05	2.48E-05	2.58E-05
2010	5.00E-05	3.43E-05	2.47E-05	2.73E-05
2040	4.97E-05	3.44E-05	2.45E-05	2.78E-05
2070	4.89E-05	3.44E-05	2.44E-05	2.33E-05
2100	4.71E-05	3.44E-05	2.42E-05	2.65E-05
2130	4.73E-05	3.45E-05	2.41E-05	2.62E-05
2160	4.75E-05	3.45E-05	2.39E-05	2.51E-05
2190	4.78E-05	3.45E-05	2.38E-05	2.21E-05
2220	4.80E-05	3.46E-05	2.36E-05	2.51E-05
2250	4.82E-05	3.46E-05	2.35E-05	2.51E-05
2280	4.84E-05	3.43E-05	2.33E-05	2.47E-05
2310	4.87E-05	3.43E-05	2.32E-05	1.72E-05
2340	4.89E-05	3.41E-05	2.30E-05	1.64E-05
2370	4.91E-05	3.56E-05	2.29E-05	1.60E-05
2400	4.93E-05	3.72E-05	2.27E-05	1.65E-05
2430	4.96E-05	3.76E-05	2.26E-05	1.61E-05
2460	4.95E-05	3.69E-05	2.24E-05	1.63E-05
2490	4.92E-05	3.62E-05	2.23E-05	1.71E-05
2520	4.92E-05	3.55E-05	2.21E-05	1.49E-05
2550	4.88E-05	3.48E-05	2.20E-05	1.53E-05
2580	4.86E-05	3.41E-05	2.24E-05	1.61E-05
2610	4.87E-05	3.37E-05	2.15E-05	1.61E-05
2640	4.88E-05	3.32E-05	2.09E-05	1.61E-05
2670	4.88E-05	3.32E-05	2.20E-05	1.83E-05
2700	4.78E-05	3.27E-05	2.19E-05	1.65E-05
2730	4.74E-05	3.26E-05	2.12E-05	1.61E-05
2760	4.67E-05	3.25E-05	2.13E-05	1.62E-05
2790	4.69E-05	3.26E-05	2.21E-05	1.57E-05
2820	4.66E-05	3.24E-05	2.21E-05	1.71E-05
2850	4.68E-05	3.24E-05	2.20E-05	1.69E-05
2880	4.70E-05	3.23E-05	2.19E-05	1.68E-05
2910	4.72E-05	3.23E-05	2.20E-05	1.64E-05
2940	4.74E-05	3.23E-05	2.14E-05	1.61E-05
2970	4.76E-05	3.23E-05	2.18E-05	1.55E-05
3000	4.78E-05	3.24E-05	2.16E-05	1.62E-05

FLIGHT NO. C-474
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5188 DATE 05/16/80)
DATE 91378 FLIGHT NO. C-474 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
3030	4.79E-05	3.24E-05	2.21E-05	1.61E-05
3060	4.81E-05	3.24E-05	2.20E-05	1.62E-05
3090	4.83E-05	3.24E-05	2.19E-05	1.54E-05
3120	4.85E-05	3.24E-05	2.19E-05	1.61E-05
3150	4.87E-05	3.24E-05	2.18E-05	1.62E-05
3180	4.86E-05	3.25E-05	2.23E-05	1.63E-05
3210	4.88E-05	3.25E-05	2.22E-05	1.66E-05
3240	4.80E-05	3.25E-05	2.22E-05	1.58E-05
3270	4.74E-05	3.25E-05	2.18E-05	1.55E-05
3300	4.75E-05	3.25E-05	2.17E-05	1.63E-05
3330	4.74E-05	3.25E-05	2.15E-05	1.76E-05
3360	4.75E-05	3.27E-05	2.15E-05	1.78E-05
3390	4.75E-05	3.23E-05	2.15E-05	1.77E-05
3420	4.76E-05	3.25E-05	2.14E-05	1.76E-05
3450	4.76E-05	3.27E-05	2.14E-05	1.76E-05
3480	4.77E-05	3.26E-05	2.14E-05	1.75E-05
3510	4.77E-05	3.27E-05	2.13E-05	1.74E-05
3540	4.78E-05	3.29E-05	2.13E-05	1.73E-05
3570	4.78E-05	3.27E-05	2.13E-05	1.72E-05
3600	4.79E-05	3.28E-05	2.12E-05	1.72E-05
3630	4.79E-05	3.27E-05	2.12E-05	1.71E-05
3660	4.80E-05	2.67E-05	2.12E-05	1.70E-05
3690	4.79E-05	3.18E-05	2.11E-05	1.69E-05
3720	4.74E-05	3.26E-05	2.11E-05	1.68E-05
3750	4.71E-05	3.27E-05	2.11E-05	1.67E-05
3780	4.71E-05	3.26E-05	2.10E-05	1.67E-05
3810	4.65E-05	3.22E-05	2.10E-05	1.66E-05
3840	4.63E-05	3.24E-05	2.12E-05	1.65E-05
3870	4.60E-05	3.22E-05	2.18E-05	1.64E-05
3900	4.59E-05	3.21E-05	2.19E-05	1.63E-05
3930	4.58E-05	3.20E-05	2.19E-05	1.63E-05
3960	4.56E-05	3.18E-05	2.14E-05	1.62E-05
3990	4.45E-05	3.18E-05	2.11E-05	1.60E-05
4020	4.47E-05	3.18E-05	2.09E-05	1.61E-05
4050	4.49E-05	3.19E-05	2.11E-05	1.66E-05
4080	4.51E-05	3.19E-05	2.12E-05	1.54E-05
4110	4.54E-05	3.19E-05	2.13E-05	1.66E-05
4140	4.56E-05	3.20E-05	2.13E-05	1.56E-05
4170	4.58E-05	3.20E-05	2.21E-05	1.60E-05
4200	4.60E-05	3.20E-05	2.13E-05	1.64E-05
4230	4.62E-05	3.20E-05	2.11E-05	1.57E-05
4260	4.67E-05	3.21E-05	2.14E-05	1.56E-05
4290	4.56E-05	3.21E-05	2.11E-05	1.59E-05
4320	4.16E-05	3.21E-05	2.15E-05	1.62E-05
4350	4.37E-05	3.21E-05	2.13E-05	1.64E-05
4380	4.52E-05	3.18E-05	2.15E-05	1.67E-05
4410	4.46E-05	3.18E-05	2.13E-05	1.60E-05
4440	4.41E-05	3.15E-05	2.12E-05	1.64E-05
4470	4.44E-05	3.15E-05	2.12E-05	1.67E-05
4500	4.46E-05	3.15E-05	2.12E-05	1.53E-05

FLIGHT NO. C-474
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5180 DATE 05/16/80)
DATE 91378 FLIGHT NO. C-474 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.47E-05	3.12E-05	2.12E-05	1.71E-05
4560	4.48E-05	3.10E-05	2.12E-05	1.66E-05
4590	4.49E-05	3.11E-05	2.12E-05	1.74E-05
4620	4.50E-05	3.12E-05	2.12E-05	1.70E-05
4650	4.51E-05	3.12E-05	2.12E-05	1.70E-05
4680	4.52E-05	3.13E-05	2.12E-05	1.70E-05
4710	4.54E-05	3.14E-05	2.12E-05	1.70E-05
4740	4.53E-05	3.15E-05	2.11E-05	1.70E-05
4770	4.50E-05	3.16E-05	2.11E-05	1.70E-05
4800	4.47E-05	3.16E-05	2.11E-05	1.70E-05
4830	4.47E-05	3.17E-05	2.11E-05	1.70E-05
4860	4.43E-05	3.18E-05	2.11E-05	1.70E-05
4890	4.45E-05	3.19E-05	2.11E-05	1.70E-05
4920	4.46E-05	3.20E-05	2.11E-05	1.70E-05
4950	4.48E-05	3.13E-05	2.10E-05	1.69E-05
4980	4.50E-05	3.11E-05	2.10E-05	1.69E-05
5010	4.51E-05	3.09E-05	2.10E-05	1.69E-05
5040	4.53E-05	3.09E-05	2.10E-05	1.69E-05
5070	4.54E-05	3.09E-05	2.10E-05	1.69E-05
5100	4.56E-05	3.08E-05	2.10E-05	1.69E-05
5130	4.55E-05	(3.07E-05)	2.09E-05	1.69E-05
5160	4.49E-05	(3.06E-05)	2.10E-05	1.69E-05
5190	4.42E-05	(3.05E-05)	2.12E-05	1.69E-05
5220	4.41E-05	(3.04E-05)	2.04E-05	1.69E-05
5250	4.42E-05	(3.03E-05)	2.07E-05	1.69E-05
5280	4.37E-05	(3.02E-05)	2.10E-05	1.69E-05
5310	4.41E-05	(3.01E-05)	2.03E-05	1.52E-05
5340	4.39E-05	(3.00E-05)	2.05E-05	1.59E-05
5370	4.36E-05	(2.99E-05)	2.07E-05	1.59E-05
5400	(4.35E-05)	(2.98E-05)	2.03E-05	1.60E-05
5430	(4.33E-05)	(2.97E-05)	2.03E-05	1.66E-05
5460	(4.32E-05)	(2.96E-05)	2.05E-05	1.80E-05
5490	(4.31E-05)	(2.96E-05)	2.08E-05	(1.79E-05)
5520	(4.29E-05)	(2.95E-05)	(2.07E-05)	(1.79E-05)
5550	(4.28E-05)	(2.94E-05)	(2.06E-05)	(1.78E-05)
5580	(4.26E-05)	(2.93E-05)	(2.06E-05)	(1.78E-05)
5610	(4.25E-05)	(2.92E-05)	(2.05E-05)	(1.77E-05)
5640	(4.24E-05)	(2.91E-05)	(2.04E-05)	(1.77E-05)
5670	(4.22E-05)	(2.90E-05)	(2.04E-05)	(1.76E-05)
5700	(4.21E-05)	(2.89E-05)	(2.03E-05)	(1.75E-05)
FIRST DATA ALT	0	0	0	0
LAST DATA ALT	5370	5100	5490	5460

FLIGHT NO. C-474
EQUIVALENT ATTENUATION LENGTH

(JOB 5188 DATE 05/16/80)
DATE 91378 FLIGHT NO. C-474 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	7.69E 03	1.30E 04	2.33E 04	3.03E 04
300	6.61E 03	1.25E 04	1.52E 04	2.39E 04
600	7.14E 03	1.33E 04	1.44E 04	2.20E 04
900	8.23E 03	1.25E 04	1.50E 04	2.10E 04
1200	9.57E 03	1.27E 04	1.74E 04	2.38E 04
1500	1.06E 04	1.42E 04	1.97E 04	2.62E 04
1800	1.15E 04	1.55E 04	2.17E 04	2.80E 04
2100	1.22E 04	1.66E 04	2.32E 04	2.92E 04
2400	1.29E 04	1.75E 04	2.46E 04	3.06E 04
2700	1.34E 04	1.83E 04	2.59E 04	3.24E 04
3000	1.39E 04	1.91E 04	2.71E 04	3.40E 04
3300	1.44E 04	1.98E 04	2.82E 04	3.55E 04
3600	1.48E 04	2.04E 04	2.91E 04	3.66E 04
3900	1.51E 04	2.09E 04	3.00E 04	3.78E 04
4200	1.55E 04	2.14E 04	3.08E 04	3.89E 04
4500	1.58E 04	2.19E 04	3.15E 04	3.98E 04
4800	1.61E 04	2.23E 04	3.22E 04	4.07E 04
5100	1.63E 04	2.27E 04	3.28E 04	4.14E 04
5400	1.66E 04	2.31E 04	3.34E 04	4.22E 04
5700	1.69E 04	2.35E 04	3.40E 04	4.28E 04

FLIGHT NO. C-474
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.56E-01	9.76E-01	9.81E-01	9.88E-01
600	9.19E-01	9.56E-01	9.59E-01	9.73E-01
900	8.96E-01	9.31E-01	9.42E-01	9.58E-01
1200	8.82E-01	9.16E-01	9.33E-01	9.51E-01
1500	8.68E-01	9.00E-01	9.27E-01	9.44E-01
1800	8.55E-01	8.90E-01	9.20E-01	9.38E-01
2100	8.42E-01	8.81E-01	9.14E-01	9.31E-01
2400	8.30E-01	8.72E-01	9.07E-01	9.25E-01
2700	8.18E-01	8.63E-01	9.01E-01	9.20E-01
3000	8.06E-01	8.54E-01	8.95E-01	9.16E-01
3300	7.95E-01	8.46E-01	8.89E-01	9.11E-01
3600	7.83E-01	8.38E-01	8.84E-01	9.05E-01
3900	7.72E-01	8.30E-01	8.78E-01	9.02E-01
4200	7.62E-01	8.22E-01	8.72E-01	8.98E-01
4500	7.52E-01	8.14E-01	8.67E-01	8.93E-01
4800	7.42E-01	8.07E-01	8.61E-01	8.89E-01
5100	7.32E-01	7.99E-01	8.56E-01	8.84E-01
5400	7.22E-01	7.92E-01	8.51E-01	8.80E-01
5700	7.13E-01	7.85E-01	8.45E-01	8.75E-01

FLIGHT C-475 - 15 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1301	1458	1 95	49.3	-	60.1	150	6180
4,5	1506	1652	1.77	61.0	-	76.5	180	6150

Flight Description. Flight C-475 was an afternoon flight with take off at 1155 and landing at 1750 GMT. There were scattered variable broken stratocumulus clouds and thin broken variable thin overcast cirrus. The resulting effect was overcast. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that they were working basically the main track which was extended to the east and west as necessary. At 1303 GMT at 360 meters (1200 feet) there was scattered stratocumulus at 1050 meters (3500 feet) and high thin broken cirrus. The stratocumulus were dissipating with about 1/8 to 2/8 coverage and the cloud base distinguished the top of the haze. At 1324 GMT at 960 meters (3200 feet) scattered stratocumulus was at 1050 meters (3500 feet) and high thin broken cirrus. Track was running very close to the cloud base and on occasion we passed very near or directly under a cloud. Cloud cover is increasing now up to 2/8 to 3/8 and becoming troublesome. On the climb possible cloud debris at 1170 meters (3900 meters), cloud tops 1290 meters (4300 feet) and clear above. At 1355 GMT at 3000 meters (10,000 feet) high thin overcast cirrus with scattered variable broken stratocumulus below Stratocumulus is broken along entire track at this time - mostly clear areas exist north and south. Cirrus is tending to increase in intensity. The sun is shining brightly through the cirrus but occasional areas of heavier cirrus are in the area On the climb thin layers of haze are distinguishable to above 3600 meters (12,000 meters). About 1510 GMT at 360 meters (1200 feet) flown in eastern third and farther to east in clear air area as the track is becoming heavy in cloud. At 1535 GMT at 690 meters (3200 feet) right at top of haze layer and in clear away from stratocumulus. Climb started between patches of cloud and out of haze completely almost immediately. At 1600 GMT stratocumulus below appears to be trying to dissipate with large holes - second filter was over clear area. At 1625 GMT at 6000 meters (20,000 feet) high thin overcast cirrus with broken stratocumulus (overcast immediately below) slant range 32 kilometers (20 miles). Sc below now appears to be more dense than previous for first filter; second filter broken variable scattered Sc near end of filter. Last descent top of haze was 900 meters (3000 feet) with very muted haze layers above. Boundary layer has been strongly suppressed by cold air flow and high pressure influence.

Local Weather Notes. Yeovilton, 14.8 kilometers northwest of track center, reported 3/8 to 5/8 cumulus and stratocumulus at 540 to 600 meters (1800 to 2000 feet) and 5/8 to 6/8 high cirrus with 25 to 30 kilometers visibility.

Portland, 46.3 kilometers south of the track center, reported 2/8 cumulus and stratocumulus at 450 meters (1500 feet) increasing to 4/8 by 1500 GMT and to 6/8 at 600 meters (2000 feet) by 1700 GMT. There was also 4/8 cirrostratus until 1400 GMT. Visibility was 16 kilometers decreasing to 10 kilometers at 1560 GMT.

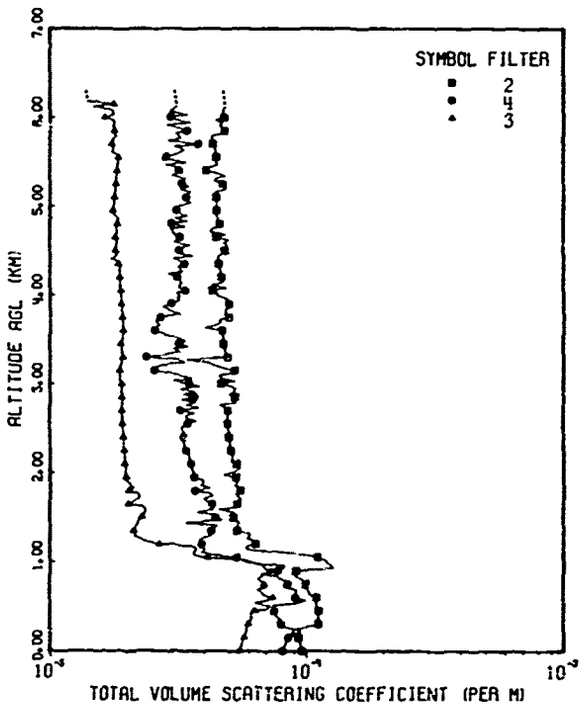
Bournemouth Hurn, 46.4 kilometers eastsoutheast of track center, recorded 1/8 cumulus and stratocumulus at 1050 meters (3500 feet) with 6/8 to 7/8 cirrus at 7500 meters (25,000 feet) and visibility 30 kilometers.

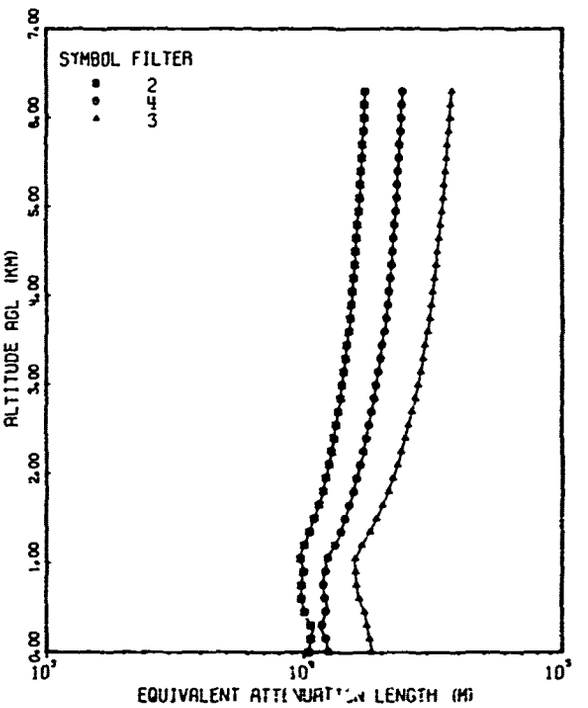
The radiosonde station at Crawley was 160 kilometers east and in an airflow parallel to the track. The 1200 GMT sounding was warmer and drier below 560 millibars than at 0000 GMT.

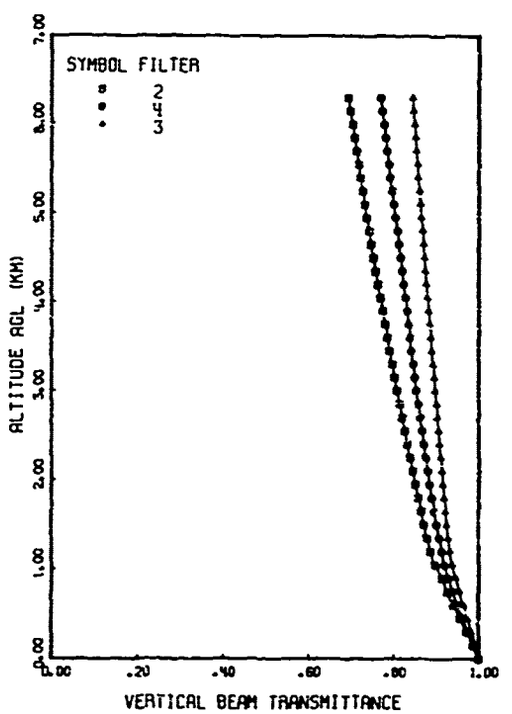
Synoptic Remarks. The surface chart for 0000 GMT had a high pressure cell centered at 46.5°N 16°W with the track in the northeastern quadrant with westnorthwesterly flow. From a low south of Iceland, an occluded front extended eastsoutheast then as a warm front from the triple point to Northern Ireland. The cold front part of the system extended southwest in the Atlantic. By 1200 GMT the occlusion had moved eastward and was located on the border of Norway and Sweden. The cold front part of the system extended from the triple point southwest to the North Sea then westward through Newcastle-on-Tyne to Belfast, into Donegal Bay and the Atlantic where it was stationary. A 1028 millibar high was located 3° west of Brest. The track had light westerly flow with the high center southwest. At 0000 GMT the 500 millibar chart showed zonal westerlies with moderate to strong westnorthwesterly flow over the track. The situation showed little change at 1200 GMT and the strong westnorthwesterly flow continued. The air mass was modified maritime polar. The 1310 GMT satellite map indicated that the cold front was in the English Channel

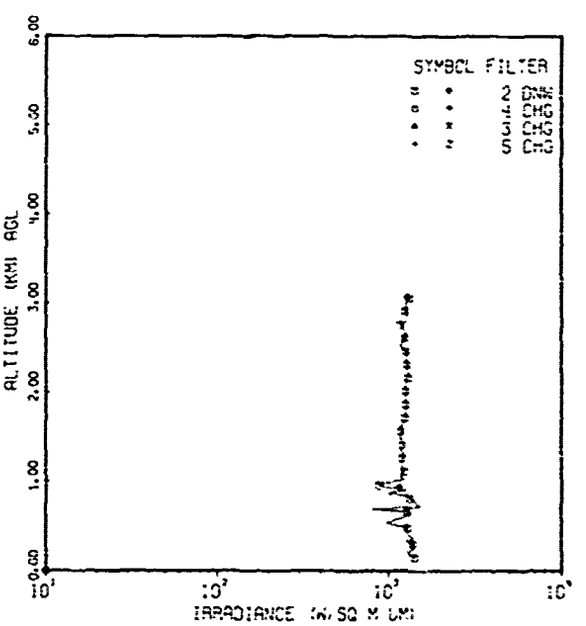
FLIGHT NO. C-475

YEOVILTON









FLIGHT NO. C-475
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5233 DATE 05/16/80)
DATE 81578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3
0	9.61E-05	8.07E-05	5.47E-05
30	9.54E-05	8.15E-05	5.52E-05
60	9.47E-05	8.24E-05	5.56E-05
90	9.41E-05	8.32E-05	5.61E-05
120	9.34E-05	8.40E-05	5.66E-05
150	9.27E-05	8.48E-05	5.71E-05
180	8.87E-05	8.57E-05	5.75E-05
210	8.78E-05	9.44E-05	5.80E-05
240	8.91E-05	9.32E-05	5.85E-05
270	1.01E-04	8.19E-05	5.90E-05
300	1.12E-04	7.97E-05	5.94E-05
330	1.04E-04	7.75E-05	6.05E-05
360	1.12E-04	7.92E-05	5.12E-05
390	1.11E-04	7.61E-05	6.10E-05
420	1.11E-04	7.56E-05	6.07E-05
450	1.12E-04	7.47E-05	6.28E-05
480	1.08E-04	7.43E-05	7.13E-05
510	1.10E-04	7.39E-05	7.19E-05
540	1.09E-04	9.15E-05	6.31E-05
570	1.09E-04	9.94E-05	6.97E-05
600	1.10E-04	9.08E-05	7.40E-05
630	1.03E-04	9.08E-05	6.87E-05
660	1.03E-04	9.10E-05	6.71E-05
690	1.01E-04	9.12E-05	6.47E-05
720	9.95E-05	8.21E-05	6.99E-05
750	9.95E-05	8.46E-05	6.85E-05
780	9.95E-05	8.71E-05	6.70E-05
810	9.59E-05	7.89E-05	5.47E-05
840	9.08E-05	7.71E-05	5.74E-05
870	9.17E-05	6.68E-05	6.81E-05
900	9.06E-05	7.68E-05	7.23E-05
930	1.27E-04	8.04E-05	5.85E-05
960	1.25E-04	8.18E-05	6.76E-05
990	1.20E-04	5.90E-05	6.20E-05
1020	1.18E-04	5.56E-05	5.74E-05
1050	1.10E-04	5.35E-05	4.11E-05
1080	9.86E-05	4.32E-05	3.64E-05
1110	8.14E-05	3.91E-05	3.63E-05
1140	5.86E-05	4.00E-05	3.70E-05
1170	5.82E-05	3.94E-05	3.66E-05
1200	6.34E-05	3.89E-05	2.66E-05
1230	6.38E-05	3.87E-05	2.35E-05
1260	5.86E-05	3.85E-05	2.24E-05
1290	5.99E-05	4.20E-05	2.13E-05
1320	5.95E-05	4.26E-05	2.14E-05
1350	5.35E-05	4.23E-05	2.11E-05
1380	5.29E-05	4.34E-05	2.13E-05
1410	5.36E-05	4.44E-05	2.17E-05
1440	5.48E-05	3.39E-05	2.20E-05
1470	5.32E-05	4.69E-05	2.24E-05
1500	5.19E-05	4.41E-05	2.28E-05

FLIGHT NO. C-475
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5233 DATE 05/16/80)
DATE 91578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3
1530	5.15E-05	4.37E-05	2.32E-05
1560	5.20E-05	3.77E-05	2.33E-05
1590	4.58E-05	4.32E-05	2.35E-05
1620	5.48E-05	4.33E-05	2.31E-05
1650	5.37E-05	4.27E-05	2.03E-05
1680	5.52E-05	4.09E-05	2.11E-05
1710	5.46E-05	3.97E-05	2.20E-05
1740	5.37E-05	4.27E-05	2.22E-05
1770	5.30E-05	4.18E-05	2.18E-05
1800	5.48E-05	3.65E-05	2.02E-05
1830	5.50E-05	4.16E-05	2.10E-05
1860	5.20E-05	3.85E-05	2.05E-05
1890	5.35E-05	3.94E-05	2.02E-05
1920	5.43E-05	3.94E-05	1.97E-05
1950	5.31E-05	3.64E-05	1.98E-05
1980	4.76E-05	3.64E-05	1.96E-05
2010	5.18E-05	3.60E-05	1.97E-05
2040	5.47E-05	3.56E-05	1.97E-05
2070	5.47E-05	3.54E-05	1.97E-05
2100	5.32E-05	3.53E-05	1.95E-05
2130	5.09E-05	3.47E-05	1.95E-05
2160	5.10E-05	3.49E-05	1.95E-05
2190	5.10E-05	3.46E-05	1.95E-05
2220	5.07E-05	3.45E-05	1.94E-05
2250	5.05E-05	3.37E-05	1.94E-05
2280	5.03E-05	3.35E-05	1.94E-05
2310	5.01E-05	3.34E-05	1.94E-05
2340	4.99E-05	3.31E-05	1.94E-05
2370	4.98E-05	3.31E-05	1.93E-05
2400	4.96E-05	3.31E-05	1.93E-05
2430	4.98E-05	3.30E-05	1.93E-05
2460	4.95E-05	3.30E-05	1.93E-05
2490	4.94E-05	3.27E-05	1.93E-05
2520	4.96E-05	3.29E-05	1.92E-05
2550	4.93E-05	3.45E-05	1.92E-05
2580	4.91E-05	3.71E-05	1.92E-05
2610	4.93E-05	3.42E-05	1.92E-05
2640	4.94E-05	3.39E-05	1.92E-05
2670	4.94E-05	3.66E-05	1.91E-05
2700	4.93E-05	3.22E-05	1.91E-05
2730	4.87E-05	3.80E-05	1.91E-05
2760	4.59E-05	3.41E-05	1.91E-05
2790	5.28E-05	3.66E-05	1.91E-05
2820	5.14E-05	3.26E-05	1.90E-05
2850	5.24E-05	3.63E-05	1.90E-05
2880	5.00E-05	3.31E-05	1.90E-05
2910	5.23E-05	3.68E-05	1.90E-05
2940	5.27E-05	3.24E-05	1.91E-05
2970	5.16E-05	3.81E-05	1.91E-05
3000	4.63E-05	3.47E-05	1.90E-05

FLIGHT NO. C-475
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5233 DATE 05/16/80)
DATE 91578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3
3030	5.24E-05	3.04E-05	1.89E-05
3060	4.65E-05	3.55E-05	1.87E-05
3090	4.55E-05	3.24E-05	1.83E-05
3120	5.02E-05	2.93E-05	1.87E-05
3150	5.24E-05	2.54E-05	1.87E-05
3180	4.68E-05	2.54E-05	1.89E-05
3210	4.32E-05	2.73E-05	1.83E-05
3240	4.12E-05	3.33E-05	1.91E-05
3270	3.41E-05	3.17E-05	1.89E-05
3300	4.90E-05	2.36E-05	1.92E-05
3330	4.85E-05	2.87E-05	1.91E-05
3360	4.79E-05	3.21E-05	1.90E-05
3390	4.84E-05	3.05E-05	1.91E-05
3420	4.61E-05	3.44E-05	1.90E-05
3450	4.74E-05	3.18E-05	1.89E-05
3480	4.74E-05	3.36E-05	1.91E-05
3510	4.74E-05	3.22E-05	1.93E-05
3540	4.71E-05	2.85E-05	1.92E-05
3570	4.68E-05	2.77E-05	1.93E-05
3600	4.66E-05	2.55E-05	1.92E-05
3630	4.00E-05	2.55E-05	1.92E-05
3660	4.43E-05	2.66E-05	1.92E-05
3690	4.61E-05	2.59E-05	1.92E-05
3720	4.56E-05	2.59E-05	1.91E-05
3750	4.95E-05	2.68E-05	1.91E-05
3780	4.77E-05	3.20E-05	1.91E-05
3810	4.81E-05	2.97E-05	1.91E-05
3840	4.85E-05	2.88E-05	1.90E-05
3870	5.04E-05	2.76E-05	1.90E-05
3900	4.97E-05	2.97E-05	1.90E-05
3930	4.91E-05	3.17E-05	1.90E-05
3960	4.88E-05	3.14E-05	1.89E-05
3990	4.48E-05	3.20E-05	1.89E-05
4020	4.43E-05	3.12E-05	1.89E-05
4050	4.27E-05	3.35E-05	1.89E-05
4080	4.86E-05	3.18E-05	1.88E-05
4110	4.28E-05	3.21E-05	1.88E-05
4140	4.70E-05	3.25E-05	1.88E-05
4170	4.68E-05	3.20E-05	1.88E-05
4200	4.65E-05	3.13E-05	1.87E-05
4230	4.63E-05	2.90E-05	1.87E-05
4260	4.61E-05	3.26E-05	1.87E-05
4290	4.56E-05	3.22E-05	1.87E-05
4320	4.55E-05	3.17E-05	1.88E-05
4350	4.53E-05	3.34E-05	1.85E-05
4380	4.54E-05	3.21E-05	1.86E-05
4410	4.49E-05	3.03E-05	1.73E-05
4440	4.52E-05	3.57E-05	1.82E-05
4470	4.71E-05	3.10E-05	1.82E-05
4500	4.79E-05	3.20E-05	1.81E-05

FLIGHT NO. C-475
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5233 DATE 05/16/80)
DATE 91578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3
4530	4.85E-05	3.21E-05	1.81E-05
4560	4.88E-05	3.50E-05	1.82E-05
4590	4.77E-05	3.08E-05	1.83E-05
4620	4.96E-05	3.14E-05	1.81E-05
4650	4.44E-05	3.21E-05	1.80E-05
4680	4.82E-05	3.05E-05	1.82E-05
4710	4.22E-05	3.01E-05	1.83E-05
4740	4.25E-05	2.97E-05	1.82E-05
4770	4.58E-05	3.34E-05	1.81E-05
4800	4.58E-05	2.97E-05	1.83E-05
4830	4.48E-05	3.41E-05	1.84E-05
4860	4.48E-05	3.07E-05	1.84E-05
4890	4.44E-05	3.42E-05	1.80E-05
4920	4.43E-05	3.14E-05	1.76E-05
4950	4.45E-05	3.11E-05	1.76E-05
4980	4.43E-05	3.07E-05	1.77E-05
5010	4.43E-05	3.25E-05	1.77E-05
5040	4.43E-05	3.52E-05	1.78E-05
5070	4.41E-05	3.33E-05	1.78E-05
5100	4.42E-05	3.38E-05	1.79E-05
5130	4.42E-05	3.44E-05	1.79E-05
5160	4.42E-05	3.50E-05	1.79E-05
5190	4.82E-05	3.23E-05	1.80E-05
5220	4.82E-05	3.45E-05	1.80E-05
5250	4.69E-05	3.25E-05	1.81E-05
5280	4.39E-05	3.28E-05	1.81E-05
5310	4.43E-05	3.37E-05	1.82E-05
5340	4.82E-05	3.00E-05	1.82E-05
5370	4.45E-05	3.16E-05	1.83E-05
5400	4.06E-05	3.18E-05	1.83E-05
5430	4.10E-05	3.20E-05	1.83E-05
5460	4.49E-05	2.84E-05	1.84E-05
5490	4.44E-05	3.38E-05	1.84E-05
5520	4.43E-05	2.86E-05	1.85E-05
5550	4.44E-05	2.84E-05	1.85E-05
5580	4.40E-05	3.11E-05	1.86E-05
5610	4.39E-05	3.23E-05	1.75E-05
5640	4.39E-05	3.32E-05	1.77E-05
5670	4.35E-05	3.07E-05	1.76E-05
5700	4.30E-05	3.77E-05	1.75E-05
5730	4.32E-05	2.90E-05	1.76E-05
5760	4.29E-05	3.23E-05	1.77E-05
5790	4.25E-05	3.17E-05	1.82E-05
5820	4.74E-05	3.10E-05	1.78E-05
5850	4.78E-05	3.41E-05	1.79E-05
5880	4.67E-05	3.13E-05	1.77E-05
5910	4.57E-05	2.85E-05	1.77E-05
5940	4.67E-05	3.50E-05	1.78E-05
5970	4.42E-05	3.07E-05	1.77E-05
6000	4.76E-05	2.95E-05	1.64E-05

FLIGHT NO. C-475
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5233 DATE 05/16/80)
DATE 91578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3
6030		4.79E-05	3.41E-05	1.76E-05
6060		4.68E-05	2.93E-05	1.75E-05
6090		4.75E-05	3.02E-05	1.74E-05
6120		4.82E-05	3.12E-05	1.48E-05
6150		(4.81E-05)	(3.11E-05)	1.78E-05
6180		(4.79E-05)	(3.10E-05)	1.40E-05
6210		(4.77E-05)	(3.09E-05)	(1.40E-05)
6240		(4.76E-05)	(3.08E-05)	(1.39E-05)
6270		(4.74E-05)	(3.07E-05)	(1.39E-05)
6300		(4.73E-05)	(3.06E-05)	(1.38E-05)
FIRST DATA ALT		0	0	0
LAST DATA ALT		6120	6120	6180

FLIGHT NO. C-475
EQUIVALENT ATTENUATION LENGTH

(JOB 5233 DATE 05/16/80)
DATE 91578 FLIGHT NO. C-475 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3
0	1.04E 04	1.24E 04	1.83E 04
300	1.06E 04	1.17E 04	1.75E 04
600	9.80E 03	1.21E 04	1.64E 04
900	9.92E 03	1.20E 04	1.58E 04
1200	1.00E 04	1.31E 04	1.67E 04
1500	1.10E 04	1.45E 04	1.91E 04
1800	1.18E 04	1.55E 04	2.12E 04
2100	1.24E 04	1.65E 04	2.31E 04
2400	1.31E 04	1.74E 04	2.48E 04
2700	1.36E 04	1.83E 04	2.63E 04
3000	1.40E 04	1.89E 04	2.77E 04
3300	1.45E 04	1.97E 04	2.89E 04
3600	1.49E 04	2.04E 04	3.01E 04
3900	1.52E 04	2.11E 04	3.11E 04
4200	1.56E 04	2.16E 04	3.20E 04
4500	1.59E 04	2.21E 04	3.29E 04
4800	1.61E 04	2.25E 04	3.38E 04
5100	1.64E 04	2.29E 04	3.46E 04
5400	1.66E 04	2.32E 04	3.53E 04
5700	1.69E 04	2.36E 04	3.60E 04
6000	1.71E 04	2.38E 04	3.67E 04
6300	1.72E 04	2.41E 04	3.74E 04

FLIGHT NO. C-475
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3
0	1.00E 00	1.00E 00	1.00E 00
300	9.72E-01	9.75E-01	9.83E-01
600	9.41E-01	9.51E-01	9.64E-01
900	9.13E-01	9.28E-01	9.45E-01
1200	8.87E-01	9.13E-01	9.31E-01
1500	8.72E-01	9.02E-01	9.25E-01
1800	8.58E-01	8.90E-01	9.18E-01
2100	8.45E-01	8.80E-01	9.13E-01
2400	8.32E-01	8.71E-01	9.08E-01
2700	8.20E-01	8.63E-01	9.02E-01
3000	8.07E-01	8.54E-01	8.97E-01
3300	7.96E-01	8.46E-01	8.92E-01
3600	7.85E-01	8.38E-01	8.87E-01
3900	7.74E-01	8.31E-01	8.82E-01
4200	7.63E-01	8.23E-01	8.77E-01
4500	7.53E-01	8.16E-01	8.72E-01
4800	7.43E-01	8.08E-01	8.68E-01
5100	7.33E-01	8.00E-01	8.63E-01
5400	7.23E-01	7.92E-01	8.58E-01
5700	7.13E-01	7.85E-01	8.54E-01
6000	7.04E-01	7.77E-01	8.49E-01
6300	6.94E-01	7.70E-01	8.45E-01

FLIGHT C-476 - 16 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1050	1255	2.08	49.6	48.3	50.5	150	6180
4,5	1301	1451	1.83	50.8	-	62.1	180	6150

Flight Description. Flight C-476 was a midday flight with take off at 0944 and landing at 1544 GMT. There were scattered to broken cumulus and stratocumulus clouds and high thin scattered cirrus. The track was gradually displaced to the north as stratus moved in from the channel to the south of the track The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted at 1053 GMT at 360 meters (1200 feet) scattered stratus at 450 meters (1500 feet) and high scattered clouds. Slant range was 24 kilometers (15 miles). Morning stratus was still in the area but it was predominantly clear above with less than 1/8 of higher cloud. The first low level run was below 2/8 to 3/8 of dissipating stratus but with high sun angle it was generally clear above with short periods of being beneath a patch of stratus. At 1110 GMT at 1050 meters (3500 feet) there was scattered variable broken stratocumulus at 450 meters (1500 feet) and scattered cirrus at 7500 meters (25,000 feet). The first filter was taken over predominantly broken stratocumulus in the last half. The second filter was over predominantly scattered stratocumulus. Haze does not show a marked break at cloud elevation, but haze extends up to about 1050 to 1200 meters (3500 to 4000 feet). On the climb to 3000 meters (10,000 feet) the haze top was sharp at 1170 meters (3900 meters). There were layers of haze above but we were in the clear from 1170 to 1410 meters (3900 to 4700 feet); in light haze 1440-1590 meters (4800 to 5300 feet); thin layer at 2100 meters (7000 feet), another at 2550 meters (8500 feet), also 2850 to 3000 meters (9500 to 10,000 feet). At 1145 GMT at 3000 meters (10,000 feet) scattered stratocumulus at 450 meters (1500 feet), and 2/8 cirrus greater than 7500 meters (25,000 feet), light haze with slant range 32 kilometers (20 miles). We may be in a layer of haze at this level that is very thin. At 1225 GMT at 6000 meters (20,000 feet) horizon was indistinct in gray haze, slant range was 56 kilometers (35 miles). On the descent light haze began about 1350 meters (4500 meet) and was more dense at 1050 meters (3500 feet). It appeared to be more sharply depressed by high pressure subsidence than earlier. Turbulence began at 600 meters (2000 feet). At 1303 GMT at 300 meters (1000 feet) we were right at the bases of stratus and stratocumulus; first filter was under most broken areas but second filter was better. At 1330 GMT slant range was 16 kilometers (10 miles) and at 1355 GMT it was 24 to 32 kilometers (15 to 20 miles) in light haze. At 1335 GMT set up on line over scattered stratocumulus. Thin layers of haze visible but generally below - above not distinguished during westward climb. Second filter was run under area of thin broken cirrus. At 1430 GMT at 6000 meters (20,000 feet) there was no discernible difference between 3000 and 6000 meter haze condition. Horizon was actually sharper at 3000 meters possibly indicating more haze at 6000 meters or at least more scattering On the descent a white band existed above the horizon below 6000 meters whereas, looking west, the white band was at the elevation of the horizon at 6000 meters (haze layer?). The white band is "airlift" not cirrus in the distance. Base of this "layer" may be in the vicinity of 4800 meters (16,000 feet). Start losing definition due to steep look angle below 4500 meters (10,000 feet).

Local Weather Notes. Yeovilton, 14 8 kilometers northwest of track center, reported 4/8 cumulus and stratocumulus at 450 to 600 meters (1500 to 2000 feet) decreasing to 2/8 by 1500 GMT. There were also 4/8 altocumulus at 3000 meters (20,000 feet) reported only at 1400 GMT and 3/8 to 1/8 high cirrus. Visibility was 15 kilometers.

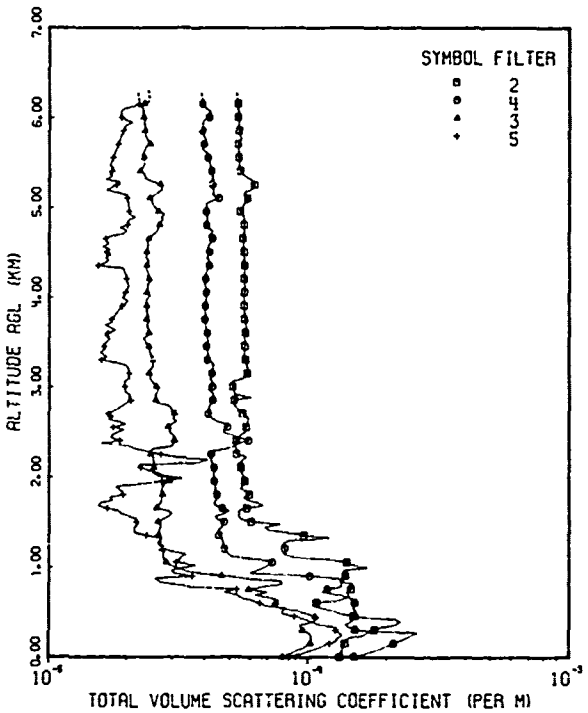
Portland, 46.3 kilometers south of track center, recorded 4/8 to 8/8 stratocumulus at 600 to 750 meters (2000 to 2500 feet) with visibility 25 kilometers decreasing to 16 kilometers by 1200 GMT.

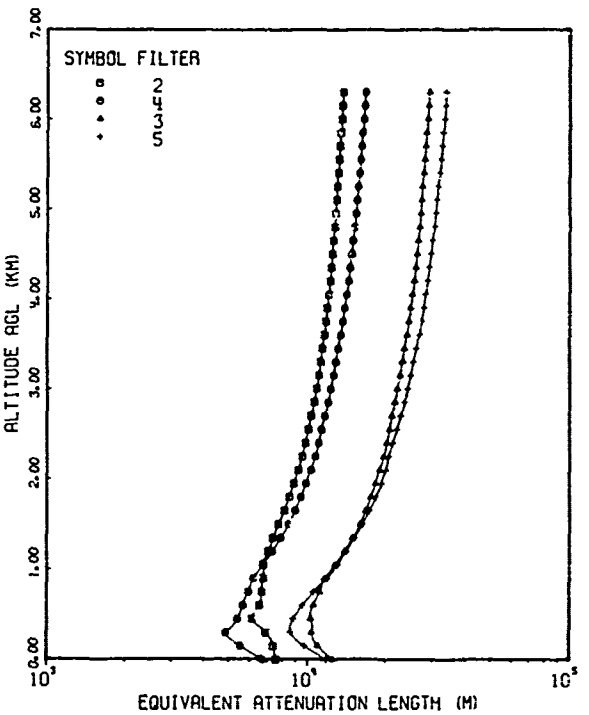
Bournemouth Hurn, 46.4 kilometers eastsoutheast of the track center, reported 5/8 to 3/8 cumulus at 600 to 660 meters (2000 to 2200 feet) increasing to 6/8 to 7/8 and lowering to 330 to 390 meters (1100 to 1300 feet) after 1400 GMT Visibility was 20 to 25 kilometers lowering to 18 kilometers at 1400 GMT and to 10 kilometers at 1600 GMT.

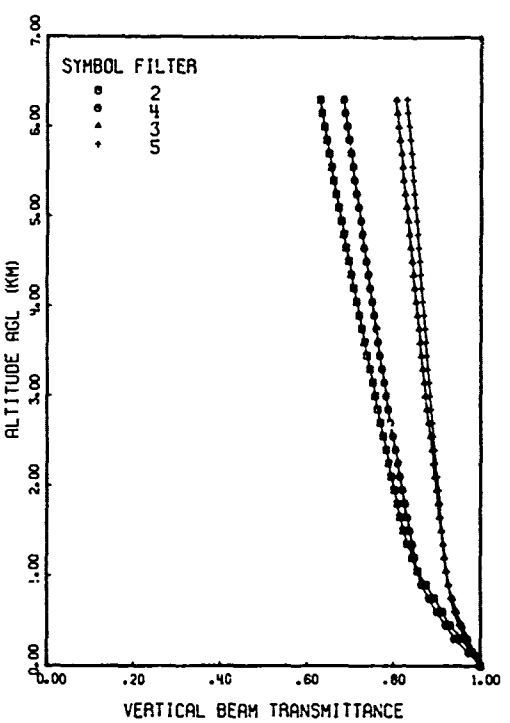
The radiosonde station at Crawley was 160 kilometers east and in a flow parallel to the track. The sounding showed more moisture below 480 millibars and less above at 1200 GMT than it did at 0000 GMT.

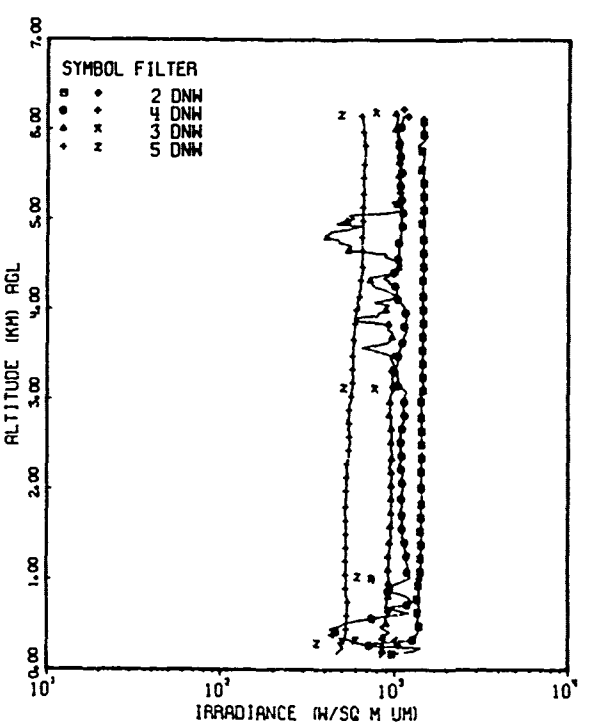
Synoptic Remarks. The 0000 GMT surface chart indicated that the high cell had moved eastward with the center located near Brest, France. A cold front extended from Kiel westward through Newcastle-on-Tyne and Belfast into the Atlantic. At 1200 GMT the high had continued to move eastward with the center now located near Orleans, France The track was in the northwestern quadrant of the high with light southwesterly winds. A cold frontal system was approaching the Irish coast The 500 millibar chart for 0000 GMT showed weak ridging through Spain to Great Britain. The track had moderate to strong northwesterly flow. At 1200 GMT there was weak ridging from northeastern Spain to the North Sea. There was moderate westerly flow over the track at this level. The air mass was modified maritime polar. There were no satellite maps for this day.

FLIGHT NO. C-476
YEOVILTON









FLIGHT NO. C-476
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 4054 DATE 05/12/80)
DATE 91678 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	1.32E-04	1.50E-04	8.00E-05	8.47E-05
30	1.33E-04	1.62E-04	8.45E-05	9.20E-05
60	1.35E-04	1.75E-04	8.90E-05	9.93E-05
90	1.36E-04	1.87E-04	9.35E-05	1.07E-04
120	1.37E-04	2.00E-04	9.80E-05	1.14E-04
150	1.39E-04	2.12E-04	1.02E-04	1.21E-04
180	1.40E-04	2.24E-04	1.03E-04	1.28E-04
210	1.43E-04	2.37E-04	1.03E-04	1.29E-04
240	1.61E-04	2.49E-04	1.03E-04	1.35E-04
270	1.68E-04	2.62E-04	1.01E-04	1.32E-04
300	1.79E-04	1.51E-04	9.53E-05	1.28E-04
330	1.90E-04	1.43E-04	9.35E-05	1.27E-04
360	2.16E-04	1.39E-04	9.29E-05	1.09E-04
390	2.25E-04	1.46E-04	1.04E-04	1.04E-04
420	2.15E-04	1.50E-04	1.08E-04	9.78E-05
450	1.49E-04	1.51E-04	1.07E-04	8.84E-05
480	1.33E-04	1.50E-04	1.00E-04	7.95E-05
510	1.27E-04	1.51E-04	9.27E-05	7.94E-05
540	1.12E-04	1.49E-04	7.85E-05	8.24E-05
570	1.06E-04	1.51E-04	7.32E-05	6.82E-05
600	1.08E-04	1.51E-04	7.51E-05	6.50E-05
630	1.30E-04	1.50E-04	7.67E-05	6.08E-05
660	1.43E-04	1.43E-04	7.10E-05	5.49E-05
690	1.43E-04	1.34E-04	6.27E-05	5.30E-05
720	1.41E-04	1.13E-04	5.96E-05	4.75E-05
750	1.46E-04	1.19E-04	5.92E-05	5.30E-05
780	1.48E-04	1.34E-04	6.69E-05	3.57E-05
810	1.48E-04	1.35E-04	7.98E-05	2.97E-05
840	1.32E-04	1.35E-04	7.82E-05	2.67E-05
870	1.39E-04	1.32E-04	5.80E-05	2.57E-05
900	1.39E-04	1.01E-04	4.61E-05	3.58E-05
930	1.39E-04	5.96E-05	3.78E-05	3.02E-05
960	1.37E-04	6.32E-05	3.34E-05	2.98E-05
990	1.69E-04	6.69E-05	3.10E-05	3.26E-05
1020	1.45E-04	7.05E-05	2.92E-05	3.68E-05
1050	1.40E-04	7.28E-05	2.84E-05	3.09E-05
1080	1.23E-04	6.62E-05	2.73E-05	3.19E-05
1110	8.74E-05	5.07E-05	2.76E-05	3.24E-05
1140	8.10E-05	4.92E-05	2.75E-05	3.38E-05
1170	8.19E-05	4.78E-05	2.78E-05	3.00E-05
1200	8.14E-05	4.75E-05	2.74E-05	2.76E-05
1230	8.08E-05	4.67E-05	2.71E-05	2.72E-05
1260	8.06E-05	4.71E-05	2.69E-05	2.65E-05
1290	8.44E-05	4.67E-05	2.70E-05	2.65E-05
1320	1.21E-04	4.63E-05	2.72E-05	2.72E-05
1350	9.63E-05	4.51E-05	2.65E-05	2.38E-05
1380	8.18E-05	4.60E-05	2.66E-05	2.13E-05
1410	6.98E-05	4.47E-05	2.66E-05	2.13E-05
1440	6.79E-05	4.65E-05	2.69E-05	2.13E-05
1470	7.78E-05	4.67E-05	2.69E-05	2.21E-05
1500	6.01E-05	4.73E-05	2.63E-05	2.17E-05

FLIGHT NO. C-476
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4054 DATE 05/19/80)
DATE 91678 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	5.44E-05	.42E-05	2.76E-05	2.18E-05
1560	5.38E-05	.38E-05	2.89E-05	2.05E-05
1590	5.41E-05	4.71E-05	2.98E-05	1.89E-05
1620	5.39E-05	.93E-05	2.88E-05	1.86E-05
1650	5.78E-05	4.64E-05	2.60E-05	1.69E-05
1680	6.69E-05	4.38E-05	2.65E-05	1.55E-05
1710	6.37E-05	4.32E-05	2.70E-05	1.59E-05
1740	5.86E-05	4.41E-05	2.71E-05	1.78E-05
1770	5.64E-05	4.49E-05	2.73E-05	1.72E-05
1800	5.92E-05	4.44E-05	2.75E-05	1.94E-05
1830	5.99E-05	4.35E-05	2.71E-05	1.92E-05
1860	5.47E-05	4.39E-05	2.72E-05	1.88E-05
1890	5.59E-05	4.37E-05	2.76E-05	1.83E-05
1920	5.56E-05	4.36E-05	2.80E-05	2.19E-05
1950	5.70E-05	4.34E-05	2.92E-05	2.73E-05
1980	5.84E-05	4.32E-05	2.96E-05	3.27E-05
2010	5.63E-05	4.32E-05	2.65E-05	2.79E-05
2040	5.51E-05	4.32E-05	2.54E-05	2.67E-05
2070	5.51E-05	4.32E-05	2.51E-05	2.42E-05
2100	5.48E-05	4.32E-05	2.53E-05	2.26E-05
2130	5.36E-05	4.29E-05	2.53E-05	2.21E-05
2160	5.48E-05	4.22E-05	2.54E-05	3.73E-05
2190	5.61E-05	4.22E-05	2.52E-05	4.09E-05
2220	5.77E-05	4.20E-05	2.53E-05	3.08E-05
2250	5.27E-05	4.22E-05	2.47E-05	2.70E-05
2280	5.28E-05	4.21E-05	2.47E-05	2.43E-05
2310	5.25E-05	4.84E-05	2.52E-05	2.16E-05
2340	5.22E-05	5.20E-05	2.99E-05	2.04E-05
2370	5.23E-05	5.37E-05	3.02E-05	1.59E-05
2400	5.27E-05	5.89E-05	3.04E-05	1.88E-05
2430	5.40E-05	5.35E-05	3.05E-05	1.75E-05
2460	5.49E-05	5.11E-05	3.03E-05	1.75E-05
2490	5.69E-05	4.68E-05	2.92E-05	1.83E-05
2520	5.73E-05	4.73E-05	2.93E-05	1.95E-05
2550	5.77E-05	4.88E-05	2.88E-05	1.79E-05
2580	5.80E-05	4.89E-05	2.98E-05	1.99E-05
2610	5.84E-05	4.47E-05	3.11E-05	1.87E-05
2640	5.88E-05	4.29E-05	3.01E-05	1.71E-05
2670	5.82E-05	4.19E-05	3.05E-05	1.79E-05
2700	5.58E-05	4.11E-05	3.05E-05	1.70E-05
2730	5.37E-05	4.18E-05	2.97E-05	1.79E-05
2760	5.27E-05	4.10E-05	2.93E-05	1.85E-05
2790	5.16E-05	4.16E-05	2.87E-05	1.92E-05
2820	5.16E-05	4.22E-05	2.60E-05	2.00E-05
2850	5.16E-05	4.27E-05	2.57E-05	2.07E-05
2880	5.01E-05	4.25E-05	2.53E-05	2.03E-05
2910	5.20E-05	4.30E-05	2.57E-05	2.06E-05
2940	5.15E-05	4.24E-05	2.62E-05	1.97E-05
2970	5.16E-05	4.12E-05	2.63E-05	1.97E-05
3000	5.09E-05	4.26E-05	2.59E-05	1.97E-05

FLIGHT NO. C-476
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4054 DATE 05/29/80)
DATE 91679 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.11E-05	4.30E-05	2.54E-05	1.96E-05
3060	5.09E-05	4.24E-05	2.49E-05	1.96E-05
3090	5.56E-05	4.17E-05	2.45E-05	2.05E-05
3120	5.76E-05	4.25E-05	2.46E-05	2.03E-05
3150	5.80E-05	4.25E-05	2.43E-05	2.05E-05
3180	5.85E-05	4.26E-05	2.44E-05	2.03E-05
3210	5.81E-05	4.27E-05	2.51E-05	2.02E-05
3240	5.77E-05	4.30E-05	2.52E-05	1.97E-05
3270	5.72E-05	4.26E-05	2.52E-05	1.83E-05
3300	5.71E-05	4.09E-05	2.51E-05	1.59E-05
3330	5.68E-05	4.10E-05	2.49E-05	1.68E-05
3360	5.66E-05	4.11E-05	2.46E-05	1.62E-05
3390	5.66E-05	4.09E-05	2.45E-05	1.58E-05
3420	5.66E-05	4.10E-05	2.44E-05	1.66E-05
3450	5.69E-05	4.06E-05	2.43E-05	1.64E-05
3480	5.68E-05	4.09E-05	2.38E-05	1.66E-05
3510	5.71E-05	4.09E-05	2.35E-05	1.69E-05
3540	5.66E-05	4.08E-05	2.32E-05	1.73E-05
3570	5.66E-05	4.08E-05	2.40E-05	1.65E-05
3600	5.70E-05	4.07E-05	2.42E-05	1.69E-05
3630	5.76E-05	4.02E-05	2.42E-05	1.81E-05
3660	5.76E-05	4.00E-05	2.40E-05	1.73E-05
3690	5.70E-05	3.99E-05	2.37E-05	1.65E-05
3720	5.66E-05	4.00E-05	2.42E-05	1.76E-05
3750	5.66E-05	3.98E-05	2.37E-05	1.75E-05
3780	5.66E-05	4.05E-05	2.42E-05	1.78E-05
3810	5.66E-05	3.99E-05	2.39E-05	1.82E-05
3840	5.66E-05	3.99E-05	2.37E-05	1.85E-05
3870	5.65E-05	4.00E-05	2.38E-05	1.88E-05
3900	5.64E-05	4.01E-05	2.38E-05	1.92E-05
3930	5.65E-05	4.03E-05	2.36E-05	1.98E-05
3960	5.65E-05	4.02E-05	2.37E-05	2.01E-05
3990	5.63E-05	4.03E-05	2.41E-05	1.93E-05
4020	5.64E-05	4.05E-05	2.44E-05	1.95E-05
4050	5.65E-05	4.03E-05	2.37E-05	1.97E-05
4080	5.66E-05	3.99E-05	2.37E-05	2.00E-05
4110	5.65E-05	4.00E-05	2.40E-05	2.02E-05
4140	5.65E-05	3.96E-05	2.39E-05	2.01E-05
4170	5.66E-05	4.03E-05	2.46E-05	2.00E-05
4200	5.63E-05	4.00E-05	2.42E-05	1.99E-05
4230	5.65E-05	3.98E-05	2.39E-05	1.97E-05
4260	5.65E-05	4.02E-05	2.40E-05	1.96E-05
4290	5.65E-05	4.06E-05	2.38E-05	1.94E-05
4320	5.65E-05	4.09E-05	2.36E-05	1.92E-05
4350	5.65E-05	4.13E-05	2.39E-05	1.55E-05
4380	5.64E-05	4.10E-05	2.40E-05	1.66E-05
4410	5.62E-05	4.12E-05	2.40E-05	1.70E-05
4440	5.64E-05	4.03E-05	2.35E-05	1.65E-05
4470	5.60E-05	4.14E-05	2.38E-05	1.74E-05
4500	5.64E-05	4.15E-05	2.38E-05	1.67E-05

FLIGHT NO. C-476
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4054 DATE 05/19/80)
DATE 71679 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	5.62E-05	4.09E-05	2.39E-05	1.72E-05
4560	5.60E-05	4.09E-05	2.40E-05	1.61E-05
4590	5.60E-05	4.17E-05	2.41E-05	1.70E-05
4620	5.61E-05	4.22E-05	2.39E-05	1.68E-05
4650	5.58E-05	4.27E-05	2.43E-05	1.66E-05
4680	5.61E-05	4.11E-05	2.48E-05	1.75E-05
4710	5.64E-05	4.25E-05	2.57E-05	1.96E-05
4740	5.62E-05	4.23E-05	2.61E-05	1.99E-05
4770	5.63E-05	4.03E-05	2.54E-05	1.87E-05
4800	5.63E-05	4.03E-05	2.66E-05	2.01E-05
4830	5.61E-05	4.03E-05	2.70E-05	2.02E-05
4860	5.61E-05	4.04E-05	2.74E-05	2.04E-05
4890	5.61E-05	4.06E-05	2.70E-05	2.15E-05
4920	5.52E-05	4.02E-05	2.78E-05	2.03E-05
4950	5.43E-05	4.03E-05	2.64E-05	2.03E-05
4980	5.48E-05	4.03E-05	2.58E-05	2.03E-05
5010	5.60E-05	4.03E-05	2.53E-05	2.02E-05
5040	5.66E-05	4.02E-05	2.49E-05	2.02E-05
5070	5.92E-05	4.26E-05	2.47E-05	2.01E-05
5100	5.81E-05	4.50E-05	2.44E-05	2.00E-05
5130	5.66E-05	4.27E-05	2.53E-05	2.00E-05
5160	5.66E-05	4.27E-05	2.63E-05	1.86E-05
5190	5.95E-05	4.27E-05	2.73E-05	1.67E-05
5220	6.18E-05	4.27E-05	2.72E-05	1.76E-05
5250	5.19E-05	4.26E-05	2.58E-05	1.83E-05
5280	6.09E-05	4.27E-05	2.52E-05	1.89E-05
5310	5.99E-05	4.27E-05	2.37E-05	1.66E-05
5340	5.62E-05	4.22E-05	2.32E-05	1.75E-05
5370	5.51E-05	4.25E-05	2.31E-05	1.72E-05
5400	5.43E-05	4.21E-05	2.24E-05	1.75E-05
5430	5.36E-05	4.18E-05	2.28E-05	1.78E-05
5460	5.39E-05	4.15E-05	2.32E-05	1.72E-05
5490	5.39E-05	4.13E-05	2.33E-05	1.74E-05
5520	5.37E-05	4.11E-05	2.37E-05	1.75E-05
5550	5.36E-05	4.09E-05	2.32E-05	1.77E-05
5580	5.36E-05	4.05E-05	2.29E-05	1.79E-05
5610	5.36E-05	4.02E-05	2.31E-05	1.80E-05
5640	5.34E-05	3.89E-05	2.35E-05	1.82E-05
5670	5.34E-05	3.92E-05	2.36E-05	1.84E-05
5700	5.34E-05	3.95E-05	2.45E-05	1.86E-05
5730	5.43E-05	4.02E-05	2.41E-05	1.87E-05
5760	5.51E-05	3.99E-05	2.37E-05	1.89E-05
5790	5.43E-05	3.93E-05	2.35E-05	1.91E-05
5820	5.41E-05	3.93E-05	2.34E-05	1.92E-05
5850	5.39E-05	3.90E-05	2.34E-05	1.94E-05
5880	5.37E-05	3.90E-05	2.33E-05	1.96E-05
5910	5.34E-05	3.88E-05	2.32E-05	1.98E-05
5940	5.35E-05	3.91E-05	2.31E-05	2.09E-05
5970	5.34E-05	3.94E-05	2.34E-05	1.96E-05
6000	5.32E-05	4.13E-05	2.30E-05	1.90E-05

FLIGHT NO. C-476
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 4054 DATE 05/19/80
DATE 81678 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3	5
6030		5.32E-05	4.06E-05	2.29E-05	1.89E-05
6060		5.37E-05	4.13E-05	2.29E-05	1.91E-05
6090		5.30E-05	4.04E-05	2.29E-05	1.93E-05
6120		5.35E-05	3.97E-05	2.26E-05	2.10E-05
6150		5.33E-05	3.89E-05	2.32E-05	2.22E-05
6180		(5.31E-05)	(3.88E-05)	2.43E-05	(2.22E-05)
6210		(5.29E-05)	(3.87E-05)	(2.42E-05)	(2.21E-05)
6240		(5.27E-05)	(3.85E-05)	(2.41E-05)	(2.20E-05)
6270		(5.26E-05)	(3.84E-05)	(2.41E-05)	(2.19E-05)
6300		(5.24E-05)	(3.83E-05)	(2.40E-05)	(2.19E-05)
FIRST DATA ALT		0	0	0	0
LAST DATA ALT		6150	6150	6180	6150

FLIGHT NO. C-476
EQUIVALENT ATTENUATION LENGTH

(JOB 4054 DATE 05/19/80)
DATE 91678 FLIGHT NO. C-476 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	7.58E 03	6.67E 03	1.25E 04	1.18E 04
300	6.90E 03	6.06E 03	1.14E 04	8.57E 03
600	6.33E 03	5.65E 03	1.05E 04	9.54E 03
900	6.73E 03	6.18E 03	1.16E 04	1.13E 04
1200	7.65E 03	7.30E 03	1.38E 04	1.49E 04
1500	7.69E 03	8.41E 03	1.58E 04	1.61E 04
1800	8.47E 03	9.38E 03	1.75E 04	1.83E 04
2100	9.16E 03	1.02E 04	1.89E 04	1.99E 04
2400	9.78E 03	1.10E 04	2.02E 04	2.12E 04
2700	1.03E 04	1.16E 04	2.11E 04	2.27E 04
3000	1.08E 04	1.22E 04	2.20E 04	2.41E 04
3300	1.12E 04	1.27E 04	2.33E 04	2.53E 04
3600	1.15E 04	1.33E 04	2.48E 04	2.65E 04
3900	1.18E 04	1.38E 04	2.47E 04	2.77E 04
4200	1.21E 04	1.43E 04	2.56E 04	2.86E 04
4500	1.24E 04	1.47E 04	2.61E 04	2.96E 04
4800	1.26E 04	1.50E 04	2.67E 04	3.05E 04
5100	1.29E 04	1.54E 04	2.72E 04	3.12E 04
5400	1.30E 04	1.57E 04	2.76E 04	3.19E 04
5700	1.32E 04	1.60E 04	2.82E 04	3.27E 04
6000	1.34E 04	1.63E 04	2.87E 04	3.33E 04
6300	1.36E 04	1.66E 04	2.91E 04	3.39E 04

FLIGHT NO. C-476
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.57E-01	9.49E-01	9.71E-01	9.66E-01
600	9.12E-01	8.99E-01	9.45E-01	9.33E-01
900	8.75E-01	8.64E-01	9.25E-01	9.27E-01
1200	8.44E-01	8.49E-01	9.17E-01	9.18E-01
1500	8.23E-01	8.37E-01	9.10E-01	9.11E-01
1800	8.09E-01	8.25E-01	9.02E-01	9.04E-01
2100	7.95E-01	8.15E-01	8.95E-01	9.00E-01
2400	7.82E-01	8.04E-01	8.88E-01	8.91E-01
2700	7.69E-01	7.92E-01	8.80E-01	8.84E-01
3000	7.57E-01	7.82E-01	8.73E-01	8.83E-01
3300	7.44E-01	7.72E-01	8.66E-01	8.78E-01
3600	7.32E-01	7.63E-01	8.60E-01	8.73E-01
3900	7.19E-01	7.54E-01	8.54E-01	8.69E-01
4200	7.07E-01	7.45E-01	8.48E-01	8.63E-01
4500	6.95E-01	7.36E-01	8.42E-01	8.59E-01
4800	6.84E-01	7.27E-01	8.35E-01	8.54E-01
5100	6.72E-01	7.18E-01	8.29E-01	8.49E-01
5400	6.61E-01	7.09E-01	8.23E-01	8.44E-01
5700	6.50E-01	7.00E-01	8.17E-01	8.40E-01
6000	6.40E-01	6.92E-01	8.11E-01	8.35E-01
6300	6.30E-01	6.84E-01	8.05E-01	8.30E-01

FLIGHT C-477 - 18 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1103	1211	1.13	50.7	49.0	49.1	120	3480
4,5	1222	1334	1.37	49.2	-	52.7	120	3480

Flight Description. Flight C-477 was a midday flight spanning local apparent noon with take off at 1006 GMT and landing at 1400 GMT. There were scattered cumulus clouds and broken variable scattered altocumulus that dissipated during the course of the flight. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted at 1104 GMT at 360 meters (1200 feet) that there were scattered cumulus at about 840 meters (2800 feet) and an upper broken layer with bases about 4200 meters (14,000 feet). It was extremely clear below 750 meters (2500 feet). At 1121 GMT at 690 meters slant range was 32 kilometers (20 miles). Flight was below the scattered cumulus deck at 900 meters. The upper deck at 4200 meters appeared to be moving out of the area creating larger breaks. At 1138 GMT on the climb from 600 meters we were out of the haze layer at 960 meters (3200 feet), the upper deck was mostly dissipated and the last sun revolution was completed in the clear instead of through clouds. On the descent light haze began at 1200 meters (4000 feet) and appeared to be thicker than earlier. At 1145 and 1217 GMT at altitudes of 1200 and 360 meters the slant range was 40 kilometers (25 miles). At 1218 GMT the cloud deck at 900 meters appeared to be increasing in coverage and it looked clear to the north. By 1240 GMT the scattered deck at 900 meters appeared to be dissipating and haze density had increased from earlier run. At 1310 GMT at 3300 meters there were scattered clouds at 1200 meters and light haze with slant range 64 kilometers (40 miles). Most clouds had dissipated and the scattered deck at 900 meters had risen to 1200 meters. On the descent there were no clouds in the area of the track but scattered cirrus in the distance at about 5400 meters, scattered cumulus in the distance at 1500 meters and the haze layer started at 1350 meters.

Local Weather Notes. Yeovilton, 14.8 kilometers northwest of the track center, reported 1/8 cumulus at 750 meters (2500 feet), 3/8 to 4/8 altocumulus at 4200 meters (14,000 feet) decreasing to 1/8 by 1300 GMT, and 2/8 high thin cirrus after 1300 GMT. Visibility was 15 kilometers in haze improving to 18 kilometers by 1100 GMT and 25 kilometers by 1300 GMT.

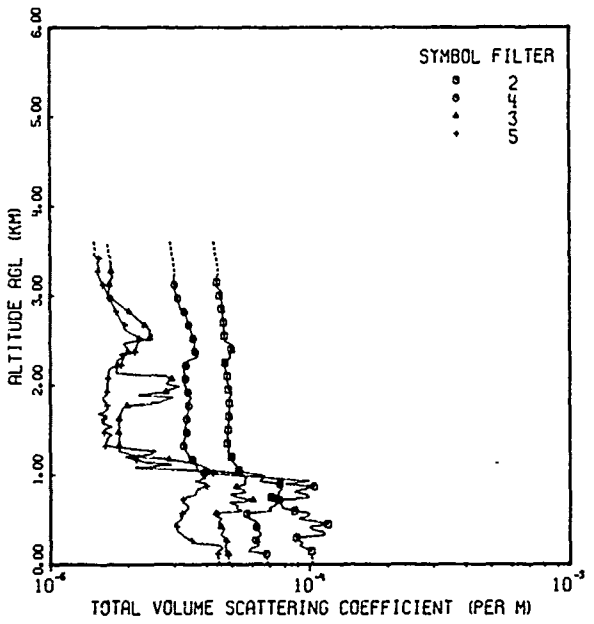
Portland, 46.3 kilometers south of the track center, observed 1/8 cumulus and stratocumulus mostly at 750 meters (2500 feet) but at 450 meters (1500 feet) at 1200 GMT. There were also altocumulus clouds varying from 1/8 to 3/8 at 4200 meters (14,000 feet) and 1/8 to 3/8 high thin cirrus after 1300 GMT. Visibility was 20 to 30 kilometers.

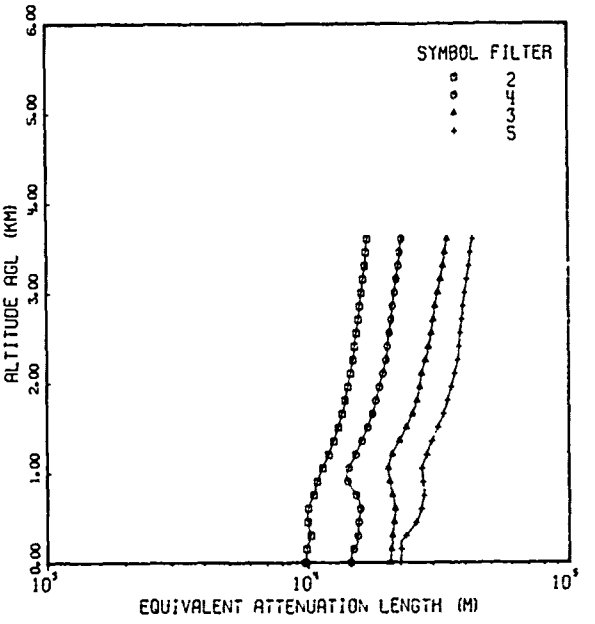
Bournemouth Hurn, 46.4 kilometers eastsoutheast of the track center, recorded 1/8 to 2/8 cumulus at 750 meters (2500 feet) becoming 1050 meters (3500 feet) after 1200 GMT, 3/8 altocumulus at 3900 meters (13,000 feet) and 1/8 to 3/8 high thin cirrus after 1300 GMT. Visibility was 40 kilometers.

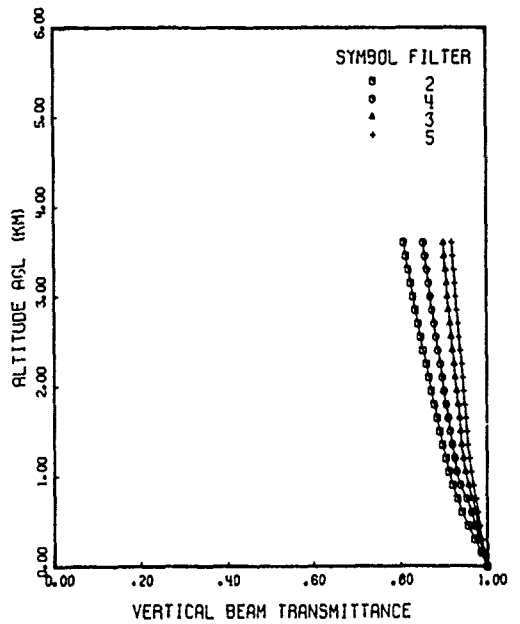
The radiosonde station at Crawley was 160 kilometers east and in a flow parallel to the track. From 0000 to 1200 GMT the sounding showed increasing moisture at all levels. Winds aloft became slightly more northwesterly at higher levels, 330° vice 3000, and increased in velocity from 22 to 35 meters per second.

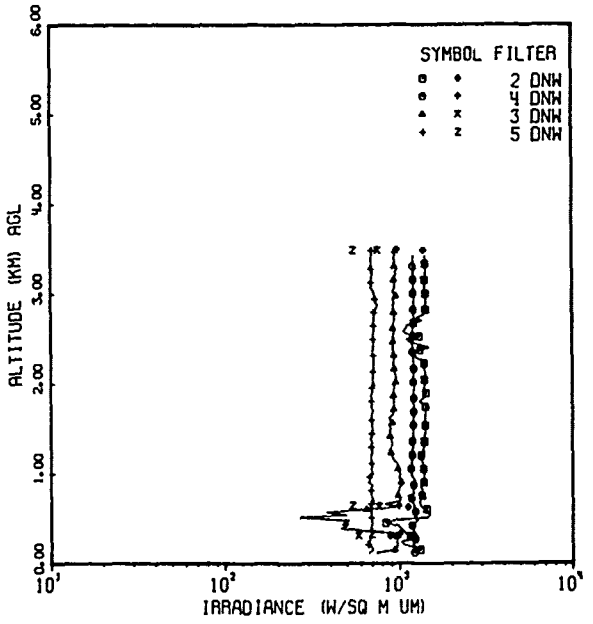
Synoptic Remarks. The surface chart for 0000 GMT had a cold front from Helsinki through Kaliningrad, Prague, Lyon and into the eastern Atlantic. A 1032 millibar high was located off southwestern Ireland with the track on the leading edge with light and variable surface winds. At 1200 GMT the 1032 millibar high was centered over central Ireland with the track located near the center. Surface flow was light and variable. There was a cold front from the Ukraine westsouthwest through Trieste, Marseilles, northern Spain and into the Atlantic. The 0000 GMT chart for 500 millibars showed a low in northeastern Sweden. There were zonal westerlies over Great Britain with the track in moderate northwesterly flow. At 1200 GMT the westerlies continued over the track and the low was located on the central Finnish coast. The air mass was maritime polar. The satellite map for 1309 GMT indicated scattered clouds over southern Great Britain.

FLIGHT NO. C-477
YEOVILTON









FLIGHT NO. C-477
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4055 DATE 05/19/80)
DATE 91878 FLIGHT NO. C-477 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.03E-04)	(6.87E-05)	(4.87E-05)	(4.44E-05)
30	(1.02E-04)	(6.83E-05)	(4.85E-05)	(4.42E-05)
60	(1.02E-04)	(6.82E-05)	(4.84E-05)	(4.41E-05)
90	(1.02E-04)	(6.80E-05)	(4.82E-05)	(4.40E-05)
120	(1.01E-04)	6.78E-05	4.81E-05	4.39E-05
150	1.01E-04	5.78E-05	4.69E-05	4.41E-05
180	9.67E-05	5.93E-05	4.72E-05	4.58E-05
210	9.08E-05	6.30E-05	4.67E-05	4.46E-05
240	9.38E-05	6.30E-05	4.76E-05	3.59E-05
270	9.04E-05	6.19E-05	4.74E-05	3.50E-05
300	8.88E-05	6.26E-05	4.67E-05	3.34E-05
330	1.14E-04	6.49E-05	4.52E-05	3.23E-05
360	1.13E-04	6.40E-05	4.59E-05	3.12E-05
390	1.02E-04	6.24E-05	4.64E-05	3.05E-05
420	9.98E-05	6.22E-05	4.52E-05	3.07E-05
450	1.17E-04	6.30E-05	4.43E-05	3.00E-05
480	1.05E-04	6.19E-05	4.43E-05	3.11E-05
510	9.07E-05	5.85E-05	4.54E-05	3.22E-05
540	9.87E-05	5.76E-05	4.31E-05	3.16E-05
570	9.95E-05	5.70E-05	4.33E-05	3.22E-05
600	8.72E-05	7.09E-05	5.46E-05	3.32E-05
630	7.82E-05	6.97E-05	5.17E-05	3.40E-05
660	7.74E-05	7.29E-05	5.25E-05	3.38E-05
690	7.66E-05	7.44E-05	4.87E-05	3.24E-05
720	6.97E-05	7.60E-05	5.02E-05	3.24E-05
750	7.06E-05	9.92E-05	5.31E-05	3.34E-05
780	7.57E-05	9.69E-05	4.90E-05	3.63E-05
810	7.51E-05	8.67E-05	5.62E-05	3.64E-05
840	7.77E-05	9.46E-05	5.49E-05	3.69E-05
870	7.73E-05	1.04E-04	5.21E-05	4.01E-05
900	7.65E-05	8.04E-05	5.63E-05	3.94E-05
930	6.39E-05	9.95E-05	5.51E-05	3.62E-05
960	6.58E-05	7.49E-05	5.64E-05	3.95E-05
990	6.65E-05	5.70E-05	5.65E-05	3.85E-05
1020	5.84E-05	3.91E-05	5.22E-05	4.22E-05
1050	5.32E-05	3.70E-05	4.14E-05	3.64E-05
1080	5.21E-05	3.66E-05	3.94E-05	2.11E-05
1110	5.18E-05	3.65E-05	3.77E-05	2.91E-05
1140	5.05E-05	3.62E-05	3.45E-05	2.35E-05
1170	4.98E-05	3.52E-05	2.85E-05	2.14E-05
1200	4.96E-05	3.40E-05	2.24E-05	1.93E-05
1230	4.90E-05	3.39E-05	2.04E-05	2.42E-05
1260	4.84E-05	3.34E-05	1.84E-05	2.55E-05
1290	4.87E-05	3.33E-05	1.85E-05	2.06E-05
1320	4.87E-05	3.27E-05	1.84E-05	1.63E-05
1350	4.80E-05	3.27E-05	1.85E-05	1.64E-05
1380	4.80E-05	3.28E-05	1.85E-05	1.67E-05
1410	4.81E-05	3.30E-05	1.84E-05	1.67E-05
1440	4.82E-05	3.33E-05	1.85E-05	1.73E-05
1470	4.82E-05	3.36E-05	1.83E-05	1.61E-05
1500	4.83E-05	3.32E-05	1.84E-05	1.61E-05

FLIGHT NO. C-477
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4055 DATE 05/19/80)
DATE 91878 FLIGHT NO. C-477 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	4.83E-05	3.31E-05	1.85E-05	1.73E-05
1560	4.84E-05	3.33E-05	1.83E-05	1.62E-05
1590	4.84E-05	3.34E-05	1.84E-05	1.57E-05
1620	4.85E-05	3.35E-05	1.84E-05	1.61E-05
1650	4.86E-05	3.36E-05	1.87E-05	1.65E-05
1680	4.86E-05	3.38E-05	1.86E-05	1.53E-05
1710	4.87E-05	3.39E-05	1.89E-05	1.64E-05
1740	4.87E-05	3.40E-05	1.90E-05	1.66E-05
1770	4.88E-05	3.42E-05	1.99E-05	1.65E-05
1800	4.88E-05	3.43E-05	2.57E-05	1.64E-05
1830	4.89E-05	3.44E-05	2.75E-05	1.61E-05
1860	4.89E-05	3.49E-05	2.95E-05	1.59E-05
1890	4.98E-05	3.44E-05	2.19E-05	1.65E-05
1920	4.99E-05	3.40E-05	2.79E-05	1.66E-05
1950	4.84E-05	3.33E-05	2.88E-05	1.66E-05
1980	4.86E-05	3.33E-05	3.14E-05	1.66E-05
2010	4.83E-05	3.29E-05	2.80E-05	1.66E-05
2040	4.79E-05	3.30E-05	2.85E-05	1.67E-05
2070	4.76E-05	3.32E-05	2.93E-05	1.67E-05
2100	4.79E-05	3.28E-05	2.75E-05	1.67E-05
2130	4.78E-05	3.29E-05	1.79E-05	1.67E-05
2160	4.72E-05	3.27E-05	1.80E-05	1.68E-05
2190	4.68E-05	3.30E-05	1.80E-05	1.71E-05
2220	4.65E-05	3.33E-05	1.81E-05	1.88E-05
2250	4.69E-05	3.34E-05	1.79E-05	1.89E-05
2280	4.78E-05	3.41E-05	1.92E-05	1.89E-05
2310	4.92E-05	3.66E-05	1.89E-05	1.93E-05
2340	4.89E-05	3.69E-05	1.96E-05	1.84E-05
2370	4.94E-05	3.62E-05	2.00E-05	2.12E-05
2400	4.98E-05	3.60E-05	2.01E-05	2.15E-05
2430	5.11E-05	3.61E-05	1.95E-05	2.16E-05
2460	4.94E-05	3.62E-05	1.92E-05	2.17E-05
2490	4.70E-05	3.59E-05	2.10E-05	2.20E-05
2520	4.69E-05	3.56E-05	2.42E-05	2.22E-05
2550	4.68E-05	3.54E-05	2.43E-05	2.15E-05
2580	4.67E-05	3.51E-05	2.40E-05	2.06E-05
2610	4.66E-05	3.48E-05	2.43E-05	1.97E-05
2640	4.65E-05	3.45E-05	2.37E-05	1.92E-05
2670	4.64E-05	3.42E-05	2.31E-05	1.95E-05
2700	4.63E-05	3.40E-05	2.25E-05	1.89E-05
2730	4.62E-05	3.37E-05	2.19E-05	1.85E-05
2760	4.61E-05	3.34E-05	2.13E-05	1.83E-05
2790	4.60E-05	3.31E-05	2.07E-05	1.81E-05
2820	4.59E-05	3.29E-05	2.01E-05	1.79E-05
2850	4.55E-05	3.18E-05	1.95E-05	1.77E-05
2880	4.57E-05	3.16E-05	1.89E-05	1.75E-05
2910	4.59E-05	3.15E-05	1.83E-05	1.73E-05
2940	4.57E-05	3.09E-05	1.78E-05	1.71E-05
2970	4.51E-05	3.11E-05	1.72E-05	1.69E-05
3000	4.48E-05	3.06E-05	1.67E-05	1.67E-05

FLIGHT NO. C-477
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4055 DATE 05/19/80)
DATE 91278 FLIGHT NO. C-477 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.56E-05	3.04E-05	1.68E-05	1.65E-05
3060	4.50E-05	3.0 E-05	1.69E-05	1.63E-05
3090	4.38E-05	3.03E-05	1.69E-05	1.61E-05
3120	4.37E-05	3.01E-05	1.69E-05	1.60E-05
3150	4.36E-05	3.00E-05	1.70E-05	1.58E-05
3180	4.35E-05	3.00E-05	1.71E-05	1.56E-05
3210	4.37E-05	2.99E-05	1.74E-05	1.54E-05
3240	4.41E-05	3.01E-05	1.71E-05	1.53E-05
3270	(4.40E-05)	(3.00E-05)	1.71E-05	1.52E-05
3300	(4.39E-05)	(2.99E-05)	1.70E-05	1.55E-05
3330	(4.37E-05)	(2.98E-05)	1.71E-05	1.53E-05
3360	(4.36E-05)	(2.97E-05)	1.71E-05	1.51E-05
3390	(4.35E-05)	(2.96E-05)	1.70E-05	1.53E-05
3420	(4.33E-05)	(2.95E-05)	(1.69E-05)	1.54E-05
3450	(4.32E-05)	(2.94E-05)	(1.69E-05)	1.47E-05
3480	(4.31E-05)	(2.93E-05)	(1.68E-05)	1.49E-05
3510	(4.29E-05)	(2.92E-05)	(1.68E-05)	(1.49E-05)
3540	(4.28E-05)	(2.91E-05)	(1.67E-05)	(1.49E-05)
3570	(4.27E-05)	(2.91E-05)	(1.67E-05)	(1.48E-05)
3600	(4.25E-05)	(2.90E-05)	(1.66E-05)	(1.48E-05)
FIRST DATA ALT	150	120	120	120
LAST DATA ALT	3240	3240	3390	3480

FLIGHT NO. C-477
EQUIVALENT ATTENUATION LENGTH

(JOB 4055 DATE 05/19/80)
DATE 91878 FLIGHT NO. C-477 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	9.74E 03	1.46E 04	2.05E 04	2.25E 04
300	1.03E 04	1.56E 04	2.10E 04	2.38E 04
600	9.97E 03	1.59E 04	2.15E 04	2.72E 04
900	1.08E 04	1.42E 04	2.05E 04	2.76E 04
1200	1.20E 04	1.53E 04	2.10E 04	2.85E 04
1500	1.31E 04	1.69E 04	2.39E 04	3.14E 04
1800	1.39E 04	1.82E 04	2.63E 04	3.42E 04
2100	1.46E 04	1.93E 04	2.73E 04	3.65E 04
2400	1.52E 04	2.02E 04	2.90E 04	3.80E 04
2700	1.56E 04	2.08E 04	3.02E 04	3.89E 04
3000	1.61E 04	2.15E 04	3.15E 04	4.02E 04
3300	1.65E 04	2.22E 04	3.29E 04	4.15E 04
3600	1.69E 04	2.29E 04	3.41E 04	4.29E 04

FLIGHT NO. C-477
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.71E-01	9.81E-01	9.86E-01	9.87E-01
600	9.42E-01	9.63E-01	9.72E-01	9.78E-01
900	9.20E-01	9.39E-01	9.57E-01	9.68E-01
1200	9.05E-01	9.24E-01	9.44E-01	9.59E-01
1500	8.92E-01	9.15E-01	9.39E-01	9.53E-01
1800	8.79E-01	9.06E-01	9.34E-01	9.49E-01
2100	8.66E-01	8.97E-01	9.25E-01	9.44E-01
2400	8.54E-01	8.88E-01	9.21E-01	9.39E-01
2700	8.42E-01	8.78E-01	9.14E-01	9.33E-01
3000	8.30E-01	8.70E-01	9.09E-01	9.28E-01
3300	8.19E-01	8.62E-01	9.04E-01	9.24E-01
3600	8.09E-01	8.55E-01	9.00E-01	9.19E-01

FLIGHT C-478 - 25 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1348	1505	1.28	64.6	-	73.8	150	6150
4,5	1515	1615	1 00	74.9	-	83.4	180	6060

Flight Description. Flight C-478 was an afternoon flight with takeoff at 1304 and landing at 1655 GMT. There were scattered variable broken cumulus clouds and broken variable overcast cirrus with the general overall effect of overcast conditions. The approximate southeast to northwest Rodby track was located south of Lolland Island, Denmark. Typical terrain features along the nearby coast north of the track were flat cultivated farmlands interspersed with occasional woods and small towns. Directly beneath the track and to the south were the relatively shallow waters of Femer Bay.

In-Flight Notes. The in-flight observer noted that conditions were purely post frontal. At 1340 GMT on the descent cloud bases were at 750 meters (2500 feet) and the haze top was at the same level. At 1354 GMT at 150 meters (500 feet) there were scatte.ed cumulus at 750 meters (2500 feet) and scattered variable broken cirrus at 6000 meters (20,000 feet) with slant range of 16 kilometers (10 miles) in moderate haze. Post frontal clouds had cleared dramatically with only scattered clouds along the track but it was very late in the day with totally non-uniform sky conditions. There was no possibility for reliable scanner data. On the climb the top of the haze was 900 meters (3000 feet). At 1404 GMT at 1500 meters (5000 feet) there were scattered cumulus at 750 meters and broken variable overcast cirrus at 6000 meters. Slant range was 24 kilometers (15 miles) in light to moderate haze and there were scattered cumulus over the island to the north. On the climb to 3000 meters a secondary haze layer top was at 2400 meters and there could have been a layer from 2100 to 2400 meters but it was not seen until we were above it. At 1425 GMT at 3000 meters there were cumulus to the north and south and the slant range was 48 kilometers (30 miles) in light haze. At 1450 GMT at 6000 meters there were scattered cumulus at 750 meters to the north and south and overcast cirrus at 7500 meters with slant range 64 kilometers (40 miles) in very light haze. On the descent there was no apparent structure from 6000 to 2700 meters; haze layers between 2400 and 2700 meters; heavier haze started at 1350 meters. Clouds were moving in from the west and we were descending through a hole; stratocumulus were from 1260 to 1140 meters and there was moderate haze below. At 1525 GMT on the climb towards the east the haze top was 1350 meters. At 1528 GMT at 1500 meters the slant range was 16 kilometers (10 miles) in light haze At 1535 GMT at 3000 meters in addition to the two earlier reported cloud decks there was scattered altostratus at 2400 meters, slant range was 16 kilometers (10 miles). At 1555 GMT on the climb from 3000 to 6000 meters a very muted haze layer was visible against the horizon to the west and there may be a very weak layer present along the track in the 4200 to 5400 meter level. At 1600 GMT at 6000 meters the slant range was 24 kilometers (15 miles) in light haze. On the final descent the haze tops were 2700 meters and the haze appeared to be denser than previous.

Local Weather Notes. Kegnaes, 75 kilometers west-northwest of the track center, reported 4/8 to 6/8 cumulonimbus at 750 to 720 meters (2500 to 2400 feet) and visibility 18 to 20 kilometers.

Gedser Rev, 73.9 kilometers east of the track center, observed 2/8 stratocumulus at 750 meters (2500 feet), 6/8 thin altocumulus at 4500 meters (15,000 feet) and 7/8 high cirrostratus at 1500 GMT. The visibility was 22 kilometers.

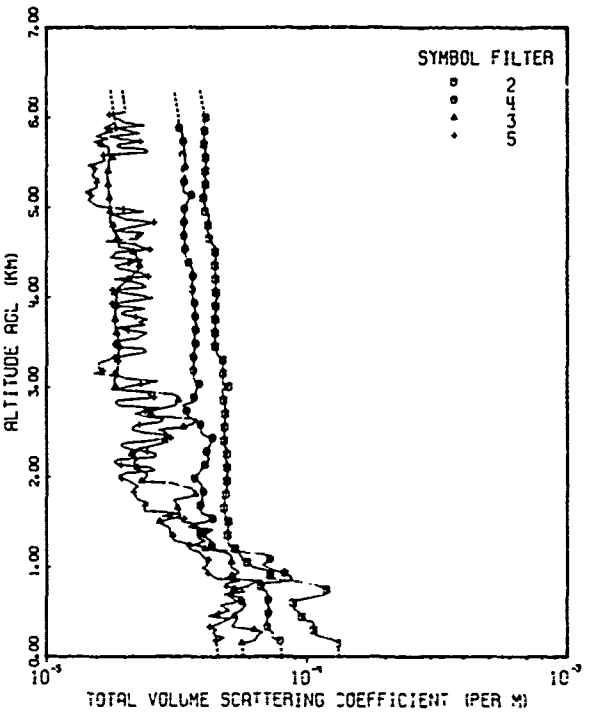
Omo, 53.7 kilometers northnorthwest of the track center, recorded 2/8 to 6/8 cumulonimbus at 750 meters (2500 feet) and 5/8 thin altocumulus at 4500 meters (15,000 feet) with visibility 20 kilometers.

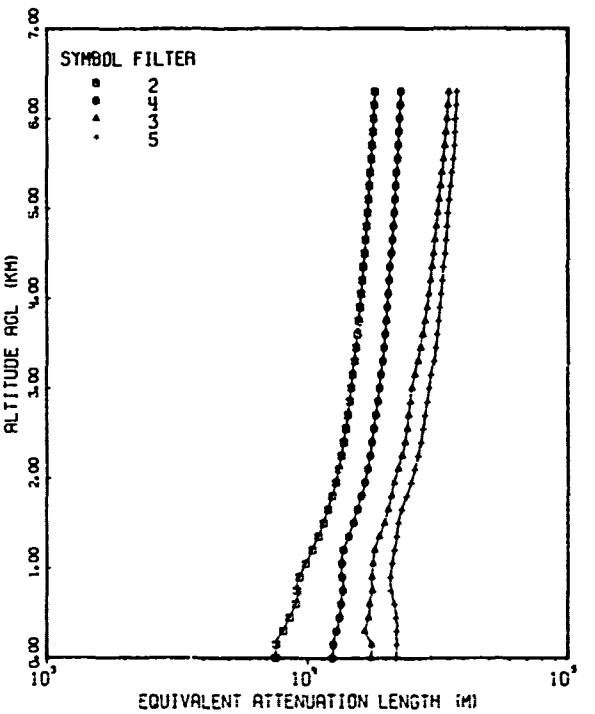
The radiosonde station at Schleswig was 103 kilometers west and upstream from the track. At all levels the 1200 GMT sounding was colder than 0000 GMT confirming the frontal passage. The winds above 800 millibars are stronger and more westerly than at 0000 GMT.

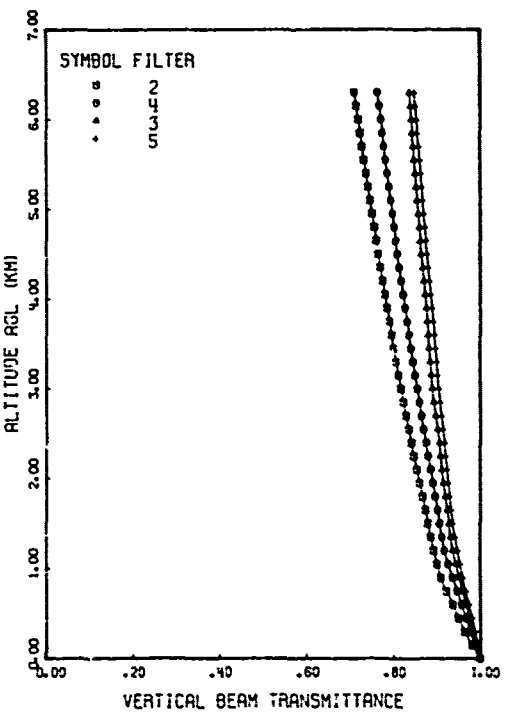
Synoptic Remarks. The surface chart for 0000 GMT showed an occlusion that extended southeast to northern Scandinavia, a warm front from Scandinavia southeast to northwestern Russia, a cold front from the Gulf of Bothnia, Copenhagen, into the North Sea and through the English Channel to the Atlantic. At 1200 GMT the chart indicated that the cold front had passed over the track shortly after midnight and was now along a line from central Latvia, Berlin, Dijon, northern Spain and Portugal then west into the Atlantic. The track had westnorthwesterly surface flow. The 500 millibar chart for 0000 GMT had very weak ridging from Spain through western Poland with the track in strong westerly flow. At 1200 GMT there were zonal westerlies with strong (70 knots) westerly flow over the track. The air mass was maritime polar. The satellite map for 1310 GMT indicated a weak front south of the track.

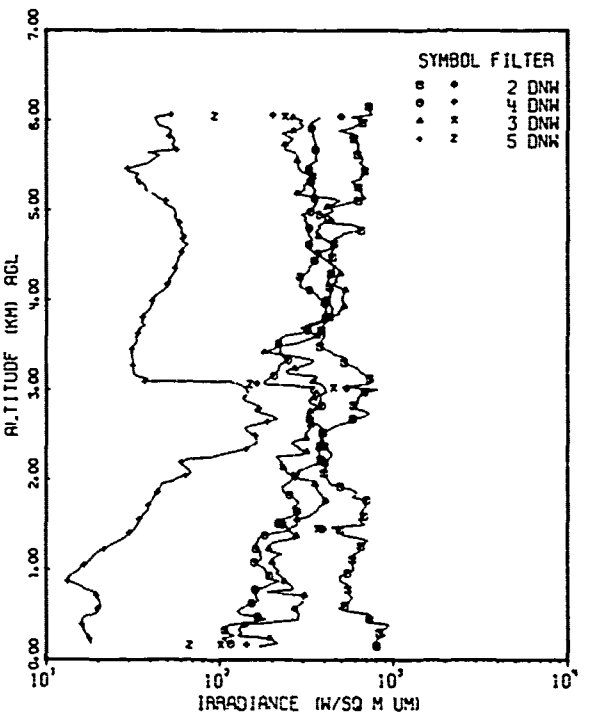
FLIGHT NO. C-478

RODBY









FLIGHT NO. C-478
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4056 DATE 05/19/80)
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.33E-04)	(8.01E-05)	(5.69E-05)	(4.56E-05)
30	(1.32E-04)	(7.97E-05)	(5.65E-05)	(4.53E-05)
60	(1.32E-04)	(7.95E-05)	(5.55E-05)	(4.52E-05)
90	(1.32E-04)	(7.93E-05)	(5.64E-05)	(4.51E-05)
120	(1.31E-04)	(7.91E-05)	(5.62E-05)	(4.50E-05)
150	1.31E-04	(7.89E-05)	5.61E-05	(4.49E-05)
180	1.30E-04	7.87E-05	6.31E-05	4.48E-05
210	1.18E-04	7.36E-05	6.41E-05	4.83E-05
240	1.05E-04	7.36E-05	6.48E-05	4.43E-05
270	1.06E-04	7.37E-05	6.74E-05	4.37E-05
300	1.06E-04	7.11E-05	6.26E-05	4.49E-05
330	1.07E-04	7.03E-05	5.15E-05	4.24E-05
360	1.06E-04	7.02E-05	5.22E-05	4.53E-05
390	1.05E-04	6.99E-05	5.32E-05	4.75E-05
420	9.62E-05	7.06E-05	5.39E-05	5.09E-05
450	9.58E-05	7.19E-05	5.27E-05	4.18E-05
480	9.40E-05	7.11E-05	5.33E-05	4.60E-05
510	9.26E-05	7.09E-05	5.57E-05	5.04E-05
540	8.98E-05	7.17E-05	5.69E-05	4.85E-05
570	8.97E-05	7.07E-05	5.80E-05	4.66E-05
600	8.86E-05	7.06E-05	5.63E-05	5.26E-05
630	9.11E-05	7.09E-05	5.28E-05	5.63E-05
660	1.03E-04	7.09E-05	5.11E-05	5.51E-05
690	1.16E-04	6.98E-05	4.95E-05	4.78E-05
720	1.22E-04	6.97E-05	5.13E-05	5.73E-05
750	1.18E-04	6.67E-05	5.23E-05	5.54E-05
780	1.13E-04	6.61E-05	5.88E-05	4.90E-05
810	1.05E-04	6.62E-05	6.08E-05	4.87E-05
840	9.19E-05	8.52E-05	6.69E-05	5.46E-05
870	7.06E-05	8.75E-05	4.84E-05	4.48E-05
900	7.20E-05	8.47E-05	5.15E-05	4.32E-05
930	7.45E-05	8.17E-05	5.45E-05	4.15E-05
960	7.02E-05	7.36E-05	5.32E-05	4.15E-05
990	6.22E-05	7.04E-05	5.10E-05	3.95E-05
1020	6.06E-05	6.71E-05	5.09E-05	4.14E-05
1050	5.87E-05	7.09E-05	5.11E-05	4.11E-05
1080	5.63E-05	7.19E-05	5.13E-05	4.19E-05
1110	5.60E-05	7.34E-05	5.11E-05	4.01E-05
1140	5.47E-05	6.65E-05	5.02E-05	3.92E-05
1170	5.44E-05	5.47E-05	4.74E-05	3.84E-05
1200	5.27E-05	4.18E-05	4.05E-05	3.52E-05
1230	5.05E-05	4.30E-05	3.93E-05	3.53E-05
1260	4.97E-05	4.35E-05	3.42E-05	3.83E-05
1290	4.96E-05	4.27E-05	3.08E-05	4.07E-05
1320	4.95E-05	4.12E-05	3.04E-05	3.83E-05
1350	4.94E-05	3.90E-05	3.05E-05	3.83E-05
1380	4.95E-05	3.90E-05	2.97E-05	4.09E-05
1410	4.96E-05	3.91E-05	2.99E-05	4.35E-05
1440	4.97E-05	3.82E-05	2.92E-05	3.51E-05
1470	4.98E-05	3.64E-05	2.76E-05	3.75E-05
1500	4.98E-05	4.14E-05	2.72E-05	3.30E-05

FLIGHT NO. C-478
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4056 DATE 05/19/92)
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	4.88E-05	4.34E-05	2.99E-05	3.38E-05
1560	4.84E-05	4.25E-05	3.27E-05	2.77E-05
1590	4.83E-05	3.96E-05	3.24E-05	3.26E-05
1620	4.78E-05	3.90E-05	3.22E-05	2.37E-05
1650	4.79E-05	3.91E-05	3.19E-05	2.39E-05
1680	4.81E-05	3.90E-05	3.16E-05	2.33E-05
1710	4.82E-05	3.99E-05	3.14E-05	2.45E-05
1740	4.83E-05	3.95E-05	3.08E-05	2.26E-05
1770	4.85E-05	3.98E-05	3.57E-05	2.13E-05
1800	4.86E-05	3.98E-05	3.73E-05	2.17E-05
1830	4.87E-05	3.98E-05	3.70E-05	2.16E-05
1860	4.89E-05	3.94E-05	3.51E-05	2.16E-05
1890	4.90E-05	3.92E-05	3.34E-05	2.24E-05
1920	4.88E-05	3.90E-05	3.07E-05	2.15E-05
1950	4.91E-05	3.78E-05	2.30E-05	2.06E-05
1980	4.93E-05	3.69E-05	2.37E-05	1.93E-05
2010	4.90E-05	3.76E-05	2.43E-05	1.89E-05
2040	4.94E-05	3.83E-05	2.42E-05	2.02E-05
2070	4.91E-05	3.91E-05	2.26E-05	2.59E-05
2100	4.92E-05	3.98E-05	2.22E-05	2.49E-05
2130	4.90E-05	4.05E-05	2.18E-05	1.92E-05
2160	4.92E-05	4.13E-05	2.14E-05	1.81E-05
2190	4.87E-05	4.20E-05	2.22E-05	1.87E-05
2220	4.84E-05	4.15E-05	2.17E-05	2.61E-05
2250	4.91E-05	4.10E-05	2.12E-05	2.62E-05
2280	4.92E-05	4.12E-05	2.23E-05	2.42E-05
2310	4.90E-05	4.17E-05	2.24E-05	2.06E-05
2340	4.81E-05	4.23E-05	2.50E-05	1.93E-05
2370	4.79E-05	4.28E-05	2.90E-05	1.95E-05
2400	4.80E-05	4.34E-05	2.85E-05	2.48E-05
2430	4.80E-05	4.33E-05	2.88E-05	2.99E-05
2460	4.81E-05	4.03E-05	2.83E-05	2.92E-05
2490	4.81E-05	3.91E-05	2.88E-05	2.36E-05
2520	4.82E-05	3.91E-05	2.68E-05	2.13E-05
2550	4.82E-05	3.91E-05	3.36E-05	2.15E-05
2580	4.83E-05	3.89E-05	3.61E-05	2.27E-05
2610	4.83E-05	3.82E-05	3.73E-05	2.75E-05
2640	4.84E-05	3.61E-05	3.75E-05	2.81E-05
2670	4.84E-05	3.47E-05	2.59E-05	2.39E-05
2700	4.85E-05	3.50E-05	2.51E-05	2.18E-05
2730	4.84E-05	3.45E-05	2.53E-05	2.40E-05
2760	4.87E-05	3.43E-05	2.79E-05	2.71E-05
2790	4.83E-05	3.33E-05	3.12E-05	1.89E-05
2820	4.79E-05	3.62E-05	3.17E-05	1.84E-05
2850	4.77E-05	3.65E-05	3.20E-05	1.98E-05
2880	4.77E-05	3.69E-05	3.24E-05	2.59E-05
2910	4.77E-05	3.72E-05	3.09E-05	2.44E-05
2940	4.74E-05	3.75E-05	2.47E-05	2.54E-05
2970	4.76E-05	3.78E-05	1.85E-05	1.78E-05
3000	5.00E-05	3.81E-05	1.84E-05	2.04E-05

FLIGHT NO. C-478
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 4056 DATE 05/19/80)
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.76E-05	3.86E-05	1.83E-05	2.31E-05
3060	4.76E-05	3.74E-05	1.82E-05	2.67E-05
3090	4.76E-05	3.68E-05	1.82E-05	2.05E-05
3120	4.76E-05	3.67E-05	1.88E-05	1.88E-05
3150	4.76E-05	3.67E-05	1.84E-05	1.52E-05
3180	4.76E-05	3.67E-05	1.88E-05	1.65E-05
3210	4.76E-05	3.67E-05	1.88E-05	1.59E-05
3240	4.76E-05	3.67E-05	1.88E-05	1.59E-05
3270	4.75E-05	3.66E-05	1.87E-05	1.59E-05
3300	4.73E-05	3.66E-05	1.87E-05	1.72E-05
3330	4.63E-05	3.56E-05	1.88E-05	1.83E-05
3360	4.50E-05	3.67E-05	1.83E-05	2.12E-05
3390	4.47E-05	3.69E-05	1.89E-05	2.40E-05
3420	4.45E-05	3.70E-05	1.89E-05	2.37E-05
3450	4.43E-05	3.71E-05	1.90E-05	1.81E-05
3480	4.41E-05	3.73E-05	1.99E-05	1.83E-05
3510	4.43E-05	3.68E-05	1.88E-05	1.84E-05
3540	4.43E-05	3.69E-05	1.87E-05	2.21E-05
3570	4.43E-05	3.71E-05	1.85E-05	2.31E-05
3600	4.43E-05	3.72E-05	1.86E-05	2.42E-05
3630	4.43E-05	3.74E-05	1.85E-05	2.05E-05
3660	4.44E-05	3.75E-05	1.84E-05	1.86E-05
3690	4.44E-05	3.76E-05	1.83E-05	2.39E-05
3720	4.44E-05	3.72E-05	1.83E-05	2.25E-05
3750	4.44E-05	3.75E-05	1.83E-05	2.44E-05
3780	4.44E-05	3.73E-05	1.81E-05	2.19E-05
3810	4.44E-05	3.72E-05	1.85E-05	1.94E-05
3840	4.48E-05	3.71E-05	1.83E-05	2.00E-05
3870	4.47E-05	3.71E-05	1.85E-05	2.38E-05
3900	4.46E-05	3.70E-05	1.84E-05	1.92E-05
3930	4.47E-05	3.70E-05	1.87E-05	1.79E-05
3960	4.48E-05	3.69E-05	1.84E-05	2.17E-05
3990	4.55E-05	3.65E-05	1.87E-05	2.56E-05
4020	4.48E-05	3.62E-05	1.84E-05	2.25E-05
4050	4.48E-05	3.61E-05	1.92E-05	1.94E-05
4080	4.47E-05	3.62E-05	1.85E-05	1.80E-05
4110	4.47E-05	3.63E-05	1.90E-05	2.41E-05
4140	4.47E-05	3.63E-05	1.96E-05	2.33E-05
4170	4.46E-05	3.64E-05	2.01E-05	2.14E-05
4200	4.46E-05	3.65E-05	2.07E-05	1.81E-05
4230	4.46E-05	3.69E-05	2.12E-05	2.46E-05
4260	4.45E-05	3.60E-05	2.13E-05	2.33E-05
4290	4.45E-05	3.67E-05	2.24E-05	2.11E-05
4320	4.45E-05	3.62E-05	2.29E-05	1.89E-05
4350	4.44E-05	3.56E-05	2.28E-05	1.83E-05
4380	4.44E-05	3.51E-05	2.27E-05	2.08E-05
4410	4.47E-05	3.46E-05	2.24E-05	2.32E-05
4440	4.45E-05	3.41E-05	2.20E-05	1.75E-05
4470	4.45E-05	3.39E-05	2.17E-05	1.82E-05
4500	4.43E-05	3.36E-05	2.14E-05	1.85E-05

FLIGHT NO. C-478
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 4056 DATE 05/19/80)
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.44E-05	3.39E-05	2.11E-05	2.49E-05
4560	4.43E-05	3.39E-05	1.89E-05	2.25E-05
4590	4.30E-05	3.39E-05	1.89E-05	2.17E-05
4620	4.28E-05	3.39E-05	1.89E-05	1.68E-05
4650	4.21E-05	3.38E-05	1.86E-05	2.24E-05
4680	4.21E-05	3.36E-05	1.85E-05	2.24E-05
4710	4.17E-05	3.36E-05	1.84E-05	2.35E-05
4740	4.15E-05	3.36E-05	1.80E-05	1.81E-05
4770	4.16E-05	3.36E-05	1.79E-05	2.05E-05
4800	4.17E-05	3.36E-05	1.79E-05	2.30E-05
4830	4.18E-05	3.37E-05	1.75E-05	2.59E-05
4860	4.19E-05	3.38E-05	1.75E-05	2.03E-05
4890	4.20E-05	3.38E-05	1.76E-05	1.90E-05
4920	4.21E-05	3.39E-05	1.78E-05	1.77E-05
4950	4.06E-05	3.40E-05	1.75E-05	2.35E-05
4980	4.05E-05	3.38E-05	1.76E-05	1.97E-05
5010	4.07E-05	3.43E-05	1.76E-05	1.58E-05
5040	4.05E-05	3.47E-05	1.75E-05	1.51E-05
5070	3.99E-05	3.52E-05	1.75E-05	1.44E-05
5100	4.00E-05	3.56E-05	1.75E-05	1.48E-05
5130	4.02E-05	3.61E-05	1.74E-05	1.49E-05
5160	4.04E-05	3.36E-05	1.74E-05	1.41E-05
5190	4.05E-05	3.35E-05	1.74E-05	1.49E-05
5220	4.07E-05	3.36E-05	1.73E-05	1.57E-05
5250	4.09E-05	3.37E-05	1.73E-05	1.57E-05
5280	4.10E-05	3.38E-05	1.73E-05	1.56E-05
5310	4.12E-05	3.40E-05	1.72E-05	1.60E-05
5340	4.03E-05	3.41E-05	1.72E-05	1.50E-05
5370	4.05E-05	3.42E-05	1.72E-05	1.52E-05
5400	4.08E-05	3.43E-05	1.73E-05	1.55E-05
5430	4.08E-05	3.39E-05	1.72E-05	1.53E-05
5460	4.09E-05	3.39E-05	1.73E-05	1.44E-05
5490	4.08E-05	3.39E-05	1.74E-05	1.55E-05
5520	4.08E-05	3.39E-05	1.74E-05	1.68E-05
5550	4.08E-05	3.40E-05	1.79E-05	1.67E-05
5580	4.07E-05	3.32E-05	1.72E-05	1.66E-05
5610	4.06E-05	3.39E-05	1.74E-05	2.44E-05
5640	4.06E-05	3.37E-05	1.74E-05	2.40E-05
5670	4.03E-05	3.37E-05	1.72E-05	1.86E-05
5700	4.01E-05	3.33E-05	1.62E-05	1.89E-05
5730	4.02E-05	3.34E-05	1.52E-05	2.29E-05
5760	4.02E-05	3.33E-05	1.72E-05	1.93E-05
5790	4.03E-05	3.32E-05	1.55E-05	1.76E-05
5820	4.03E-05	3.31E-05	1.67E-05	2.27E-05
5850	4.04E-05	3.27E-05	1.75E-05	2.06E-05
5880	4.05E-05	3.23E-05	1.67E-05	1.84E-05
5910	4.05E-05	3.19E-05	1.75E-05	2.37E-05
5940	4.06E-05	3.20E-05	1.84E-05	1.99E-05
5970	4.06E-05	3.22E-05	(1.83E-05)	1.91E-05
6000	4.09E-05	(3.20E-05)	(1.83E-05)	1.83E-05

FLIGHT NO. C-478
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 4056 DATE 05/19/80
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	FILTERS 2	4	3	5
	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
6030	4.07E-05	(3.17E-05)	(1.82E-05)	1.75E-05
6060	4.03E-05	(3.14E-05)	(1.81E-05)	2.01E-05
6090	4.00E-05	(3.17E-05)	(1.81E-05)	(2.31E-05)
6120	3.98E-05	(3.16E-05)	(1.80E-05)	(2.00E-05)
6150	(3.97E-05)	(3.15E-05)	(1.80E-05)	(1.99E-05)
6180	(3.95E-05)	(3.14E-05)	(1.79E-05)	(1.99E-05)
6210	(3.94E-05)	(3.13E-05)	(1.79E-05)	(1.98E-05)
6240	(3.93E-05)	(3.12E-05)	(1.78E-05)	(1.97E-05)
6270	(3.91E-05)	(3.11E-05)	(1.77E-05)	(1.97E-05)
6300	(3.90E-05)	(3.10E-05)	(1.77E-05)	(1.96E-05)
FIRST DATA ALT	150	180	150	180
LAST DATA ALT	6120	5970	5940	6060

FLIGHT NO. C-478
EQUIVALENT ATTENUATION LENGTH

(JOB 4056 DATE 05/19/80)
DATE 92578 FLIGHT NO. C-478 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	7.53E 03	1.25E 04	1.76E 04	2.19E 04
300	8.07E 03	1.30E 04	1.66E 04	2.21E 04
600	9.05E 03	1.35E 04	1.74E 04	2.17E 04
900	9.31E 03	1.36E 04	1.77E 04	2.09E 04
1200	1.04E 04	1.38E 04	1.82E 04	2.17E 04
1500	1.16E 04	1.51E 04	1.99E 04	2.25E 04
1800	1.25E 04	1.62E 04	2.12E 04	2.42E 04
2100	1.32E 04	1.71E 04	2.24E 04	2.59E 04
2400	1.38E 04	1.77E 04	2.39E 04	2.74E 04
2700	1.43E 04	1.84E 04	2.46E 04	2.84E 04
3000	1.48E 04	1.90E 04	2.54E 04	2.95E 04
3300	1.52E 04	1.95E 04	2.67E 04	3.08E 04
3600	1.56E 04	2.00E 04	2.78E 04	3.17E 04
3900	1.60E 04	2.04E 04	2.89E 04	3.25E 04
4200	1.63E 04	2.08E 04	2.99E 04	3.32E 04
4500	1.66E 04	2.11E 04	3.06E 04	3.40E 04
4800	1.69E 04	2.15E 04	3.14E 04	3.45E 04
5100	1.73E 04	2.19E 04	3.23E 04	3.53E 04
5400	1.75E 04	2.22E 04	3.31E 04	3.62E 04
5700	1.78E 04	2.25E 04	3.38E 04	3.69E 04
6000	1.81E 04	2.28E 04	3.46E 04	3.73E 04
6300	1.83E 04	2.31E 04	3.52E 04	3.78E 04

FLIGHT NO. C-478
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.64E-01	9.77E-01	9.82E-01	9.87E-01
600	9.36E-01	9.57E-01	9.66E-01	9.73E-01
900	9.08E-01	9.36E-01	9.50E-01	9.58E-01
1200	8.91E-01	9.17E-01	9.36E-01	9.46E-01
1500	8.78E-01	9.06E-01	9.27E-01	9.35E-01
1800	8.66E-01	8.95E-01	9.18E-01	9.28E-01
2100	8.53E-01	8.84E-01	9.11E-01	9.22E-01
2400	8.41E-01	8.73E-01	9.04E-01	9.16E-01
2700	8.28E-01	8.63E-01	8.96E-01	9.09E-01
3000	8.17E-01	8.54E-01	8.89E-01	9.03E-01
3300	8.05E-01	8.45E-01	8.84E-01	8.98E-01
3600	7.94E-01	8.35E-01	8.79E-01	8.93E-01
3900	7.84E-01	8.26E-01	8.74E-01	8.87E-01
4200	7.73E-01	8.17E-01	8.69E-01	8.81E-01
4500	7.63E-01	8.08E-01	8.63E-01	8.75E-01
4800	7.53E-01	8.00E-01	8.58E-01	8.70E-01
5100	7.44E-01	7.92E-01	8.54E-01	8.65E-01
5400	7.35E-01	7.84E-01	8.49E-01	8.61E-01
5700	7.26E-01	7.76E-01	8.45E-01	8.57E-01
6000	7.17E-01	7.68E-01	8.41E-01	8.52E-01
6300	7.09E-01	7.61E-01	8.35E-01	8.47E-01

FLIGHT C-479 - 26 SEPTEMBER 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0926	1105	1.65	59.6	-	55.9	120	4620
4,5	1109	1251	1.70	55.9	-	59.9	150	4590

Flight Description. Flight C-479 was a midday flight spanning local apparent noon with takeoff at 0853 and landing at 1320 GMT. There were several layers of clouds with an overall overcast effect after 1100 GMT. The approximate southeast to northwest Rodby track was located south of Lolland Island, Denmark. Typical terrain features along the nearby coast north of the track were flat cultivated farmlands interspersed with occasional woods and small towns. Directly beneath the track and to the south were the relatively shallow waters of Femer Bay.

In-Flight Notes. The in-flight observer noted that conditions were non-uniform during the pre cross calibration with clouds and blue sky. There might have been some short periods that were uniform during the last half. At 0925 GMT at 300 meters (1000 feet) there was 3/8 cirrus at 7500 meters with a slant range of 6.4 kilometers (4 miles) in heavy haze. There was heavy haze below 900 to 1050 meters and a south wind at the surface over Longeland with isolated puffs of fractostratus - very broken cloud debris - the flight possibly passed through these at the start. There was heavy cloudiness to the north and west with cumulus over the islands. At 0938 GMT on the climb the top of the haze was just above 900 meters (3000 feet). At 0950 GMT at 900 meters there was 3/8 cirrus at 7500 meters and slant range of 16 kilometers (10 miles) in moderate haze. At 1000 GMT on the climb to about 3000 meters the haze top was at 1200 meters and multi-layered clouds were moving in from the west with no effect as yet. At 1007 GMT and 2400 meters scattered stratocumulus and cumulus at 450 meters and 5/8 cirrus at 7500 meters with slant range of 24 kilometers (15 miles) in light haze. The last part of the ST&LV had very thin scattered altostratus overhead. At 1035 GMT at 4500 meters slant range was 48 kilometers (30 miles). At 1100 GMT on the descent it was clear to 1650 meters; haze top at 1650 meters; dense low level haze top at 1050 meters. At 1110 GMT at 300 meters there was scattered cumulus at 450 meters, 3/8 altostratus and 7/8+ cirrus with slant range of 11.2 kilometers (7 miles) in heavy haze. At 1330 GMT the sun disc was partially obscured through the cirrus. At 1145 GMT all sun modes so far had been similar through about the same thickness of cirrus. Heavier altostratus is moving in from the southwest and succeeding sun modes may change. On the climb to 2400 meters a cloud deck at 1500 meters was moving in with tops at 2100 meters. At 1155 GMT at 2400 meters there were scattered clouds at 450 and 1500 meters and 5/8 altostratus at 4500 meters Bands of stratocumulus were moving up from the south at about right angles to the track - about mid track. The altostratus was getting much heavier and the solar disc was still visible but greatly obscured. At 1230 GMT the altostratus was overcast at 4200 meters with slant range 24 kilometers (15 miles). Heavy altostratus and cirrus overhead with the disc just visible - shadows were cast. On the last descent there were lots of clouds all over. The haze layers had become much less distinct Heavy altostratus and cirrus based down to 4200 meters. Stratocumulus formed between 1500 and 2100 meters. Highest layer of haze distinguishable is 1890 meters. There was no distinction in structure seen below this level. Now only partially illuminated by sun shine through clouds.

Local Weather Notes. Kegnaes, 75 kilometers westnorthwest of track center, reported 2/8 cumulonimbus at 750 meters (2500 feet), 3/8 thin altocumulus at 4500 meters (15,000 feet) and 6/8 high cirrus with visibility 20 kilometers

Gedser Rev, 73.9 kilometers east of the track center, observed 1/8 cumulus at 1050 meters (3500 feet) 4/8 altocumulus at 4500 meters (15,000 feet) and 6/8 high thin cirrus with visibility 20 to 22 kilometers.

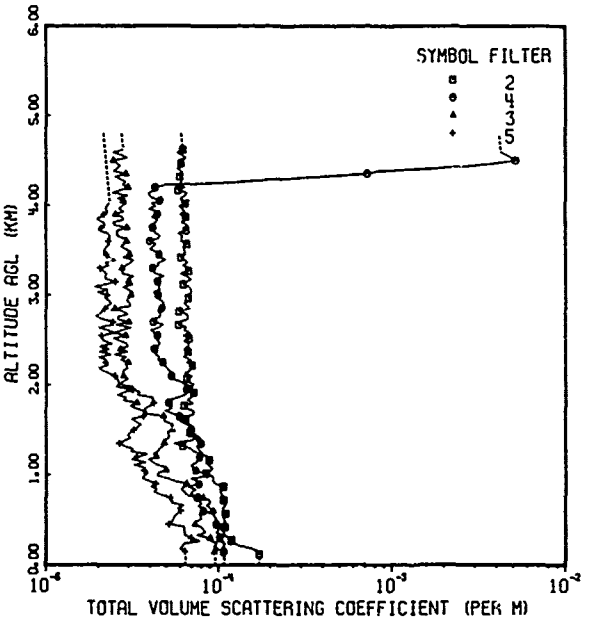
Omo, 53.7 kilometers northnorthwest of track center, recorded 4/8 altocumulus at 4500 meters (15,000 feet) and 25 kilometers visibility at 0900 GMT. By 1500 GMT there were 5/8 stratocumulus at 900 meters (3000 feet).

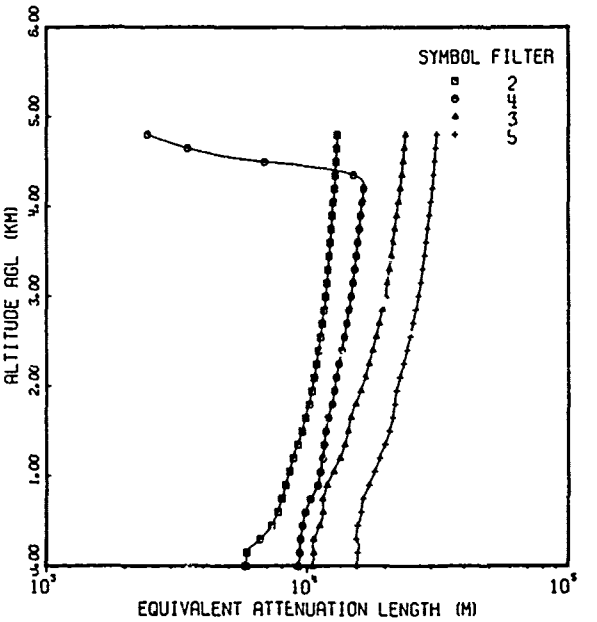
The radiosonde station at Schleswig was 103 kilometers west and upstream from the track. The 1200 GMT sounding was colder and much moister than 0000 GMT.

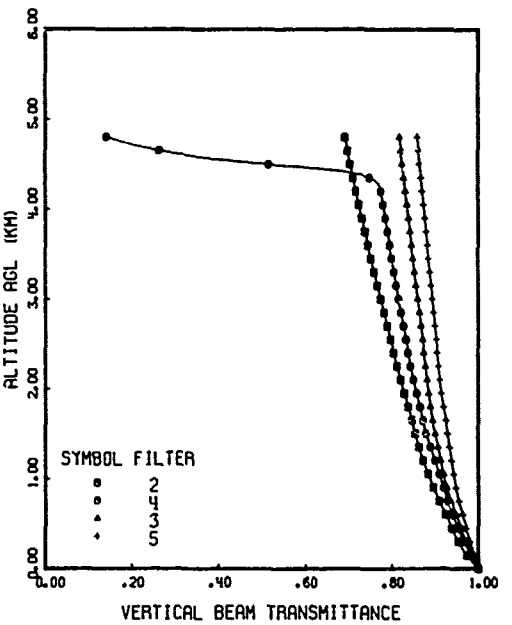
Synoptic Remarks. The surface chart for 0000 GMT showed a cold front in western Russia westsouthwest to Krakow, Stuttgart, southwestern France and northwestern Spain. At 1200 GMT the cold front was weakening and moving south and east. It was now located in central Romania, northern Yugoslavia, Corsica, central Spain, southern Portugal and into the Atlantic. The track had moderate westsouthwesterly flow. On the 0000 GMT 500 millibar chart there were zonal westerlies over the track with strong (60 knots) westerly flow. At 1200 GMT there was troughing from east of Iceland to southern France. The track continued to have strong (50 knots) westerly flow. The air mass was maritime polar. There was no satellite map for this day.

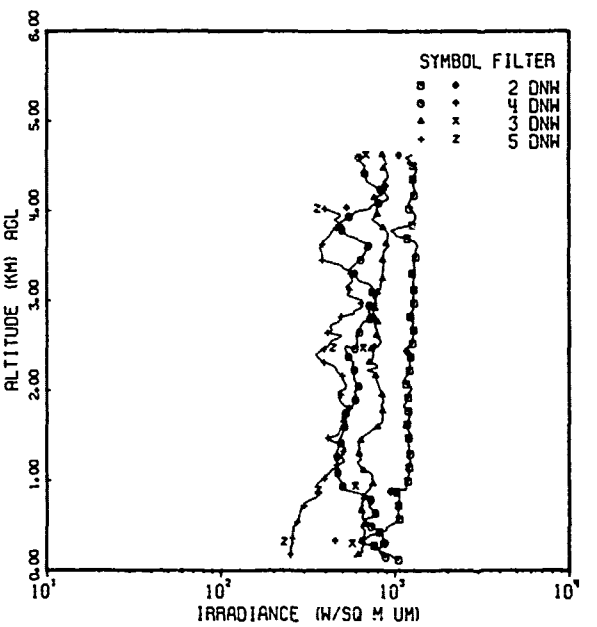
FLIGHT NO. C-479

RODBY









FLIGHT NO. C-479
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 5729 DATE 05/16/80)
DATE 92678 FLIGHT NO. C-479 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.73E-04)	(1.08E-04)	(9.56E-05)	(5.46E-05)
30	(1.72E-04)	(1.07E-04)	(9.51E-05)	(5.43E-05)
60	(1.71E-04)	(1.07E-04)	(9.49E-05)	(5.41E-05)
90	(1.71E-04)	(1.07E-04)	(9.46E-05)	(6.40E-05)
120	1.71E-04	(1.07E-04)	(9.44E-05)	(6.38E-05)
150	1.70E-04	1.06E-04	9.42E-05	6.36E-05
180	1.55E-04	1.06E-04	9.99E-05	5.96E-05
210	1.32E-04	1.07E-04	9.39E-05	5.17E-05
240	1.20E-04	1.08E-04	9.76E-05	5.39E-05
270	1.17E-04	1.02E-04	9.03E-05	7.77E-05
300	1.14E-04	1.01E-04	8.91E-05	6.91E-05
330	1.07E-04	1.05E-04	7.50E-05	6.29E-05
360	1.06E-04	9.70E-05	8.40E-05	6.29E-05
390	1.05E-04	9.94E-05	8.16E-05	6.27E-05
420	1.08E-04	1.02E-04	7.91E-05	6.25E-05
450	1.07E-04	9.66E-05	7.32E-05	5.11E-05
480	1.09E-04	9.44E-05	7.34E-05	5.37E-05
510	1.07E-04	9.70E-05	7.95E-05	5.47E-05
540	1.08E-04	9.41E-05	7.89E-05	5.55E-05
570	1.09E-04	9.25E-05	7.78E-05	5.79E-05
600	1.08E-04	8.18E-05	9.29E-05	5.04E-05
630	1.05E-04	8.11E-05	8.98E-05	5.77E-05
660	1.09E-04	7.60E-05	8.55E-05	6.26E-05
690	1.05E-04	8.02E-05	8.93E-05	5.33E-05
720	1.07E-04	7.64E-05	8.91E-05	5.33E-05
750	1.06E-04	7.52E-05	8.12E-05	5.22E-05
780	1.03E-04	6.41E-05	5.87E-05	4.55E-05
810	1.01E-04	6.26E-05	5.90E-05	4.18E-05
840	1.05E-04	6.01E-05	7.33E-05	4.34E-05
870	1.05E-04	6.32E-05	6.65E-05	4.06E-05
900	9.60E-05	7.64E-05	5.48E-05	4.29E-05
930	9.18E-05	7.58E-05	5.55E-05	3.93E-05
960	9.24E-05	6.89E-05	5.04E-05	3.59E-05
990	9.12E-05	8.35E-05	4.38E-05	3.68E-05
1020	8.44E-05	8.23E-05	4.43E-05	3.87E-05
1050	8.93E-05	7.30E-05	4.91E-05	3.67E-05
1080	9.18E-05	7.05E-05	4.93E-05	3.69E-05
1110	8.68E-05	6.89E-05	4.37E-05	3.22E-05
1140	8.58E-05	7.40E-05	4.14E-05	3.76E-05
1170	8.76E-05	7.57E-05	3.90E-05	3.12E-05
1200	8.80E-05	7.74E-05	4.32E-05	3.36E-05
1230	7.88E-05	8.12E-05	4.15E-05	3.85E-05
1260	7.23E-05	7.82E-05	4.44E-05	3.09E-05
1290	6.83E-05	7.57E-05	4.55E-05	3.15E-05
1320	6.15E-05	7.46E-05	4.80E-05	2.83E-05
1350	5.47E-05	7.90E-05	4.82E-05	2.65E-05
1380	6.73E-05	7.44E-05	4.86E-05	2.83E-05
1410	7.54E-05	7.84E-05	5.13E-05	3.07E-05
1440	6.55E-05	7.38E-05	5.13E-05	2.96E-05
1470	6.77E-05	6.99E-05	5.04E-05	3.06E-05
1500	7.14E-05	6.92E-05	5.35E-05	3.22E-05

FLIGHT NO. C-479
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5729 DATE 05/16/80)
DATE 92678 FLIGHT NO. C-479 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	7.18E-05	6.74E-05	5.24E-05	3.38E-05
1560	6.67E-05	6.56E-05	5.36E-05	3.54E-05
1590	6.48E-05	6.00E-05	4.84E-05	3.30E-05
1620	6.44E-05	6.01E-05	4.81E-05	3.12E-05
1650	6.54E-05	5.89E-05	4.79E-05	3.55E-05
1680	7.19E-05	5.38E-05	3.71E-05	3.76E-05
1710	7.21E-05	4.89E-05	3.53E-05	3.79E-05
1740	6.46E-05	5.31E-05	3.31E-05	3.72E-05
1770	6.24E-05	5.21E-05	3.05E-05	4.03E-05
1800	7.06E-05	5.08E-05	3.33E-05	4.16E-05
1830	6.52E-05	5.03E-05	2.77E-05	4.07E-05
1860	6.84E-05	5.72E-05	2.89E-05	4.17E-05
1890	7.11E-05	6.37E-05	2.58E-05	3.35E-05
1920	7.13E-05	6.58E-05	2.82E-05	3.47E-05
1950	6.45E-05	6.43E-05	3.05E-05	3.15E-05
1980	6.94E-05	6.94E-05	3.07E-05	2.54E-05
2010	7.14E-05	6.21E-05	2.62E-05	2.65E-05
2040	6.50E-05	5.89E-05	2.79E-05	2.61E-05
2070	6.49E-05	5.26E-05	2.97E-05	2.56E-05
2100	6.97E-05	5.28E-05	2.79E-05	2.49E-05
2130	6.31E-05	5.39E-05	2.79E-05	2.30E-05
2160	6.76E-05	5.09E-05	2.78E-05	2.12E-05
2190	7.00E-05	4.96E-05	2.96E-05	2.01E-05
2220	7.03E-05	4.83E-05	2.90E-05	2.28E-05
2250	6.43E-05	4.72E-05	2.98E-05	2.19E-05
2280	6.88E-05	4.41E-05	2.70E-05	2.23E-05
2310	6.22E-05	4.51E-05	2.91E-05	2.01E-05
2340	6.54E-05	4.26E-05	2.47E-05	2.37E-05
2370	6.60E-05	4.40E-05	2.96E-05	2.03E-05
2400	6.29E-05	4.22E-05	2.69E-05	2.22E-05
2430	6.65E-05	4.40E-05	2.96E-05	2.04E-05
2460	6.70E-05	4.55E-05	2.92E-05	2.40E-05
2490	6.26E-05	4.38E-05	2.69E-05	2.15E-05
2520	6.72E-05	4.47E-05	2.46E-05	2.12E-05
2550	6.18E-05	4.39E-05	2.89E-05	2.07E-05
2580	6.83E-05	4.21E-05	2.47E-05	2.47E-05
2610	6.24E-05	4.03E-05	2.75E-05	2.27E-05
2640	6.48E-05	4.50E-05	3.03E-05	2.01E-05
2670	5.82E-05	4.76E-05	2.54E-05	2.41E-05
2700	5.84E-05	4.16E-05	3.01E-05	2.45E-05
2730	6.61E-05	4.17E-05	2.60E-05	2.16E-05
2760	6.65E-05	4.57E-05	2.62E-05	1.94E-05
2790	6.46E-05	4.60E-05	2.98E-05	2.03E-05
2820	5.84E-05	4.44E-05	2.78E-05	2.12E-05
2850	6.75E-05	4.66E-05	2.48E-05	2.19E-05
2880	6.42E-05	4.75E-05	3.07E-05	2.26E-05
2910	6.25E-05	4.75E-05	3.05E-05	2.38E-05
2940	6.85E-05	4.58E-05	2.90E-05	2.28E-05
2970	6.61E-05	4.31E-05	2.99E-05	2.17E-05
3000	6.67E-05	4.41E-05	3.08E-05	2.26E-05

FLIGHT NO. C-479
TOTAL VOLUME SCATTERING COEFFICIENT

JOB 5729 DATE 05/16/80)
DATE 92678 FLIGHT NO. C-479 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
3030	6.89E-05	4.15E-05	3.18E-05	1.97E-05
3060	6.89E-05	4.52E-05	2.98E-05	2.27E-05
3090	6.66E-05	4.46E-05	2.78E-05	1.90E-05
3120	6.17E-05	4.54E-05	3.17E-05	2.19E-05
3150	6.52E-05	4.39E-05	2.39E-05	2.52E-05
3180	6.87E-05	4.25E-05	2.94E-05	2.19E-05
3210	6.40E-05	4.80E-05	3.19E-05	2.19E-05
3240	5.95E-05	4.23E-05	2.75E-05	2.22E-05
3270	6.64E-05	4.17E-05	2.74E-05	2.13E-05
3300	6.65E-05	4.11E-05	2.74E-05	2.04E-05
3330	6.11E-05	4.45E-05	2.90E-05	2.30E-05
3360	6.56E-05	4.45E-05	3.05E-05	2.19E-05
3390	6.27E-05	4.91E-05	3.20E-05	2.52E-05
3420	5.98E-05	4.43E-05	2.79E-05	2.29E-05
3450	6.34E-05	4.48E-05	3.03E-05	2.24E-05
3480	6.35E-05	4.31E-05	3.09E-05	2.14E-05
3510	6.28E-05	3.98E-05	2.70E-05	2.19E-05
3540	6.21E-05	4.15E-05	2.70E-05	2.25E-05
3570	6.49E-05	4.30E-05	2.84E-05	2.33E-05
3600	6.00E-05	3.96E-05	2.92E-05	2.29E-05
3630	6.06E-05	4.44E-05	2.82E-05	2.36E-05
3660	6.13E-05	4.56E-05	2.56E-05	2.34E-05
3690	5.79E-05	4.26E-05	2.56E-05	2.26E-05
3720	6.44E-05	4.18E-05	2.57E-05	2.00E-05
3750	6.49E-05	4.12E-05	2.93E-05	2.10E-05
3780	6.56E-05	4.06E-05	2.47E-05	2.19E-05
3810	6.04E-05	4.30E-05	2.44E-05	2.16E-05
3840	6.51E-05	4.41E-05	2.81E-05	1.97E-05
3870	6.43E-05	4.10E-05	2.77E-05	2.06E-05
3900	5.94E-05	4.39E-05	2.52E-05	2.16E-05
3930	6.34E-05	4.39E-05	2.83E-05	2.27E-05
3960	6.11E-05	3.93E-05	2.63E-05	2.21E-05
3990	5.88E-05	4.31E-05	2.77E-05	2.27E-05
4020	6.40E-05	4.08E-05	2.90E-05	2.32E-05
4050	6.05E-05	4.53E-05	2.78E-05	(2.32E-05)
4080	5.96E-05	4.10E-05	2.57E-05	(2.31E-05)
4110	6.36E-05	3.92E-05	2.95E-05	(2.30E-05)
4140	6.47E-05	3.88E-05	2.41E-05	(2.30E-05)
4170	5.75E-05	4.39E-05	2.68E-05	(2.29E-05)
4200	6.30E-05	4.24E-05	2.98E-05	(2.28E-05)
4230	5.95E-05	4.97E-05	2.76E-05	(2.27E-05)
4260	6.01E-05	1.25E-04	2.89E-05	(2.27E-05)
4290	6.06E-05	2.00E-04	2.68E-05	(2.26E-05)
4320	5.89E-05	3.84E-04	2.50E-05	(2.25E-05)
4350	6.18E-05	7.16E-04	2.90E-05	(2.25E-05)
4380	6.03E-05	8.16E-04	2.45E-05	(2.24E-05)
4410	5.71E-05	1.71E-03	2.57E-05	(2.23E-05)
4440	6.21E-05	2.78E-03	2.59E-05	(2.23E-05)
4470	6.00E-05	4.07E-03	2.54E-05	(2.22E-05)
4500	5.81E-05	5.14E-03	2.44E-05	(2.21E-05)

FLIGHT NO. C-479
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5729 DATE 05/16/80)
DATE 92678 FLIGHT NO. C-479 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	6.42E-05	4.84E-03	2.95E-05	(2.20E-05)
4560	6.07E-05	4.55E-03	2.73E-05	(2.20E-05)
4590	5.72E-05	4.24E-03	2.44E-05	(2.19E-05)
4620	6.16E-05	(4.23E-03)	2.79E-05	(2.19E-05)
4650	(6.14E-05)	(4.22E-03)	(2.78E-05)	(2.18E-05)
4680	(6.12E-05)	(4.21E-03)	(2.77E-05)	(2.17E-05)
4710	(6.10E-05)	(4.19E-03)	(2.77E-05)	(2.16E-05)
4740	(6.08E-05)	(4.18E-03)	(2.75E-05)	(2.16E-05)
4770	(6.06E-05)	(4.17E-03)	(2.75E-05)	(2.15E-05)
4800	(6.05E-05)	(4.15E-03)	(2.74E-05)	(2.14E-05)
FIRST DATA A_T	120	150	150	150
LAST DATA A_T	4620	4590	4620	4620

FLIGHT NO. C-479
EQUIVALENT ATTENUATION LENGTH

(JOB 5729 DATE 05/16/80)
DATE 1678 FLIGHT NO. C-479 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	5.79E 03	9.26E 03	1.05E 04	1.55E 04
300	6.57E 03	9.42E 03	1.06E 04	1.54E 04
600	7.70E 03	9.85E 03	1.15E 04	1.62E 04
900	8.22E 03	1.09E 04	1.18E 04	1.72E 04
1200	8.81E 03	1.14E 04	1.33E 04	1.90E 04
1500	9.55E 03	1.17E 04	1.44E 04	2.07E 04
1800	1.02E 04	1.24E 04	1.53E 04	2.17E 04
2100	1.06E 04	1.29E 04	1.57E 04	2.27E 04
2400	1.10E 04	1.35E 04	1.73E 04	2.42E 04
2700	1.14E 04	1.42E 04	1.89E 04	2.55E 04
3000	1.17E 04	1.47E 04	1.98E 04	2.67E 04
3300	1.20E 04	1.52E 04	2.05E 04	2.77E 04
3600	1.22E 04	1.56E 04	2.13E 04	2.86E 04
3900	1.24E 04	1.61E 04	2.20E 04	2.95E 04
4200	1.27E 04	1.64E 04	2.27E 04	3.02E 04
4500	1.29E 04	6.84E 03	2.33E 04	3.08E 04
4800	1.30E 04	2.45E 03	2.38E 04	3.15E 04

FLIGHT NO. C-479
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.55E-01	9.69E-01	9.72E-01	9.81E-01
600	9.25E-01	9.41E-01	9.49E-01	9.64E-01
900	8.96E-01	9.21E-01	9.27E-01	9.49E-01
1200	8.73E-01	9.00E-01	9.14E-01	9.39E-01
1500	8.55E-01	8.80E-01	9.01E-01	9.30E-01
1800	8.38E-01	8.65E-01	8.99E-01	9.20E-01
2100	8.21E-01	8.50E-01	8.82E-01	9.11E-01
2400	8.04E-01	8.38E-01	8.74E-01	9.06E-01
2700	7.89E-01	8.27E-01	8.67E-01	8.99E-01
3000	7.74E-01	8.16E-01	8.60E-01	8.94E-01
3300	7.59E-01	8.05E-01	8.52E-01	8.88E-01
3600	7.45E-01	7.94E-01	8.45E-01	8.82E-01
3900	7.31E-01	7.84E-01	8.38E-01	8.76E-01
4200	7.19E-01	7.75E-01	8.31E-01	8.70E-01
4500	7.05E-01	5.19E-01	8.24E-01	8.64E-01
4800	6.92E-01	1.40E-01	8.18E-01	8.59E-01

8. DATA INTERPRETATION AND EVALUATION

8.1. METEOROLOGICAL DATA

The basic discussion of meteorological conditions, as presented in Section 6 and summarized with each flight description, is based upon meteorological data from a number of sources. There are hourly observations from two or more weather stations for every flight. There are synoptic maps and radiosonde measurements of temperature and relative humidity. From the C-130 flight itself, there are in-flight observations by an on-board meteorologist and in-flight hemispherical pictures of the sky. In addition, there are airborne measurements of temperature and dewpoint temperature during each flight.

CLOUD CONDITIONS

The airborne meteorological observations and in-flight pictures which documented the cloud conditions during each flight were described in Table 7.2.

The flights from all the European deployments, both HAVENVIEW and OPAQUE, as summarized in Duntley, *et al.* (1978c) were grouped into five categories: (I) clear *i.e.* cloud free, during the entire flight; (II) clear during a portion of the flight; (III) scattered and/or broken clouds during the entire flight; (IV) Broken clouds varying with overcast during the flight; and (V) overcast during the entire flight. The OPAQUE V flights fell in all five of these categories. In addition to these five categories for the upper hemisphere clouds, the lower hemisphere descriptions have been divided into two categories: (1) haze, no clouds; and (2) clouds. A summary of the flights categorized by these upper and lower hemisphere cloud conditions is presented in Table 8.1.

Table 8.1. Cloud Condition Summary*

Upper Hemisphere		Lower Hemisphere		
Category	Description	Category	Description	Flights
I	Clear	1	Haze, no clouds	C-460 C-462 C-463(Filters 2,3)
		2	Clouds	None
II	Part clear, part scattered	1	Haze, no clouds	C-463(Filters 4,5)
		2	Clouds	C-466 C-467 C-468 C-469 C-472 C-474 C-476 C-477
III	Scattered and/or Broken	1	Haze, no clouds	C-461
		2	Clouds	C-479(Filters 2,3)
IV	Part Broken, Part Overcast	1	Haze, no clouds	C-473
		2	Clouds	C-475 C-478 C-479(Filters 4,5)
V	Overcast	1	Haze, no clouds	C-464(Filters 2,3) C-465,C-471
		2	Clouds	C-464(Filters 4,5)

*Categories consistent with Table 7.6 Final Report, Duntley, *et al.* (1978c)

TEMPERATURE

The temperature measurements were made using the AN/AMQ-17 aerograph set. The graphs of temperature in Fig. 6-2 are not expected to show a close correspondence between airborne temperature measurements and radiosonde temperatures for most of the flights since all but 3 flights were greater than 100 kilometers from the RAOB stations. However, for the three Soesterberg flights C-464, C-467 and C-469, the RAOB launching at DeBilt was 32 kilometers from the center of the flight track and only 13 kilometers from the near end of the flight track (see Fig. 1-1f.). The in-flight and RAOB temperature for flights C-464 and C-467 are in good agreement but the in-flight temperatures at high altitude for C-469 are significantly less than the RAOB temperatures.

For most of the flights the graphs in Fig. 6-2 show a relatively persistent set of temperature profiles throughout the flight interval. This is indicated by the general repeatability of the temperatures from one profile time interval to the next. The maximum temperature range at any given altitude was 3°C for all but four flights: C-461, C-472, C-476 and C-478. The larger temperature variability for these four flights was restricted to fairly small altitude intervals, the bulk of the temperature profile being stable with time.

Relatively persistent temperature inversions were measured on four flights: C-475, C-476, C-477 and C-478. Pronounced inversions were also present just above sea level on flights C-460 and C-461.

There were 19 project flights, listed in Table 7.3. They were accomplished between 2 August and 26 September 1978 at tracks from 37°33'N to 54°41'N latitude. Temperature data measured during these flights can be profitably compared to data from *U. S. Standard Atmosphere Supplements* (1966). To facilitate this comparison, the average temperature profile measured during each of the 19 flights has been superimposed on a graph of the July and Spring/Fall temperatures appropriate for 45°N latitude in Fig. 8-1. In addition the 37°N data are compared to the 30°N July standard temperature curve and the 48° to 54°N data are compared to the 60°N July standard temperature curve. The altitude scale in Fig. 8-1 is kilometers above mean sea level (MSL), and the ground elevations at the test sites range from 0 meters at two of the tracks, Trapani and Rodby, to 762 meters at Birkhof (48°15'N), see Table 7.1.

Most of the temperatures for the latitudes above 45°N lie between the 45°N Spring/Fall curve and the 45°N July curve. The highest temperature profiles were for flights C-460 and C-461 at Trapani 38°N. The lowest temperature profile was for flight C-479 at Rodby 52°N. The Trapani flights depart the most from the standard slopes. The Trapani profiles indicate subsidence of the upper air which is consistent with the presence of the temperature inversions near sea level. The rest of the flights, except for small isothermal or inversion regions, generally follow the standard slopes. All the temperatures are reasonable for these latitudes from 2 August to 26 September.

RELATIVE HUMIDITY

Relative humidity was computed from the measured values of ambient temperature and dewpoint (or frostpoint) temperature. The dewpoint temperatures were measured using the modified Cambridge hygrometer system [Duntley, *et al.* (1972c)].

OPAQUE V SUMMER 1978

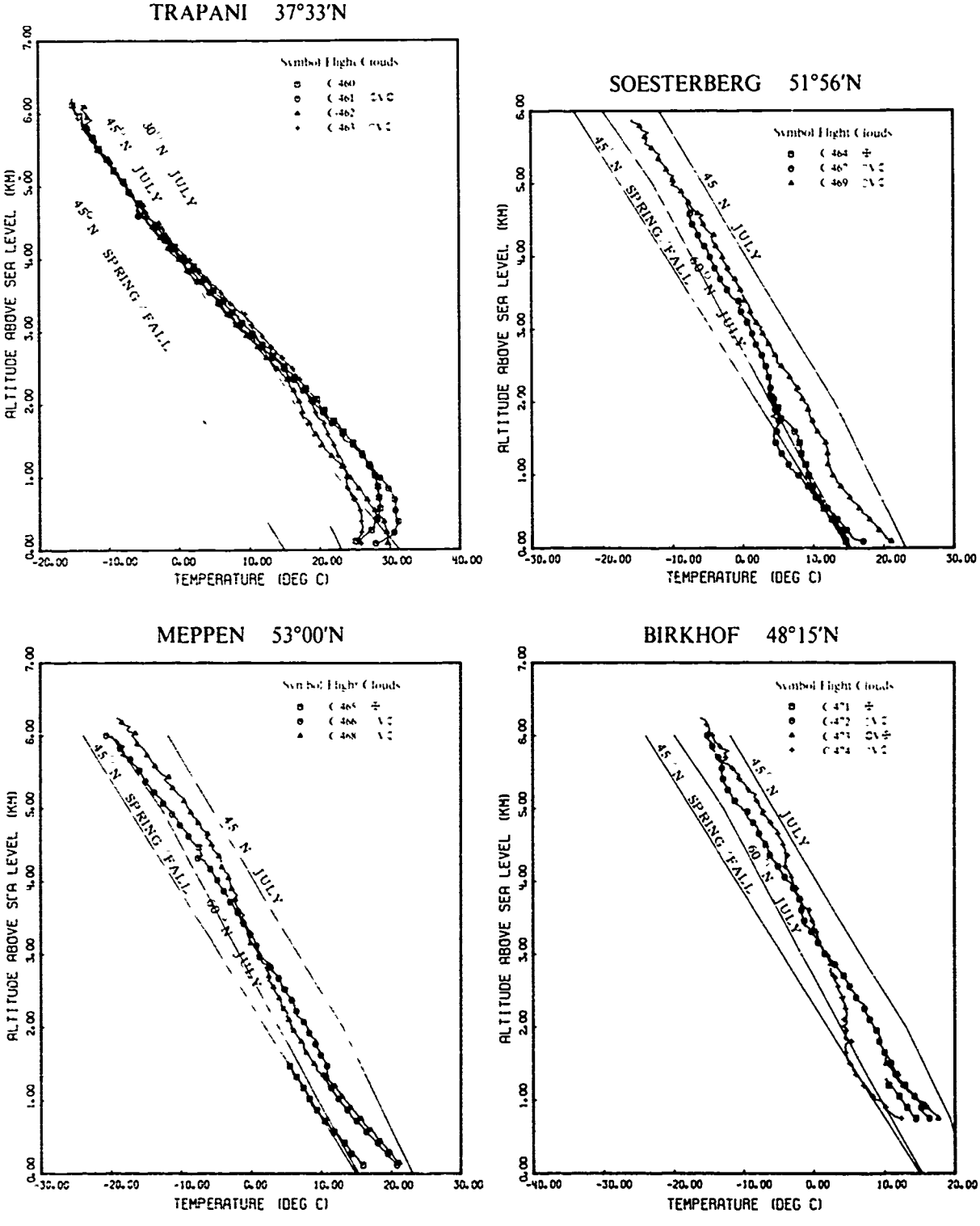


Fig 8-1 Temperature for OPAQUE V Flights from 2 August to 26 September 1978, Compared to Temperature from U.S. Standard Atmosphere Supplements (1966)

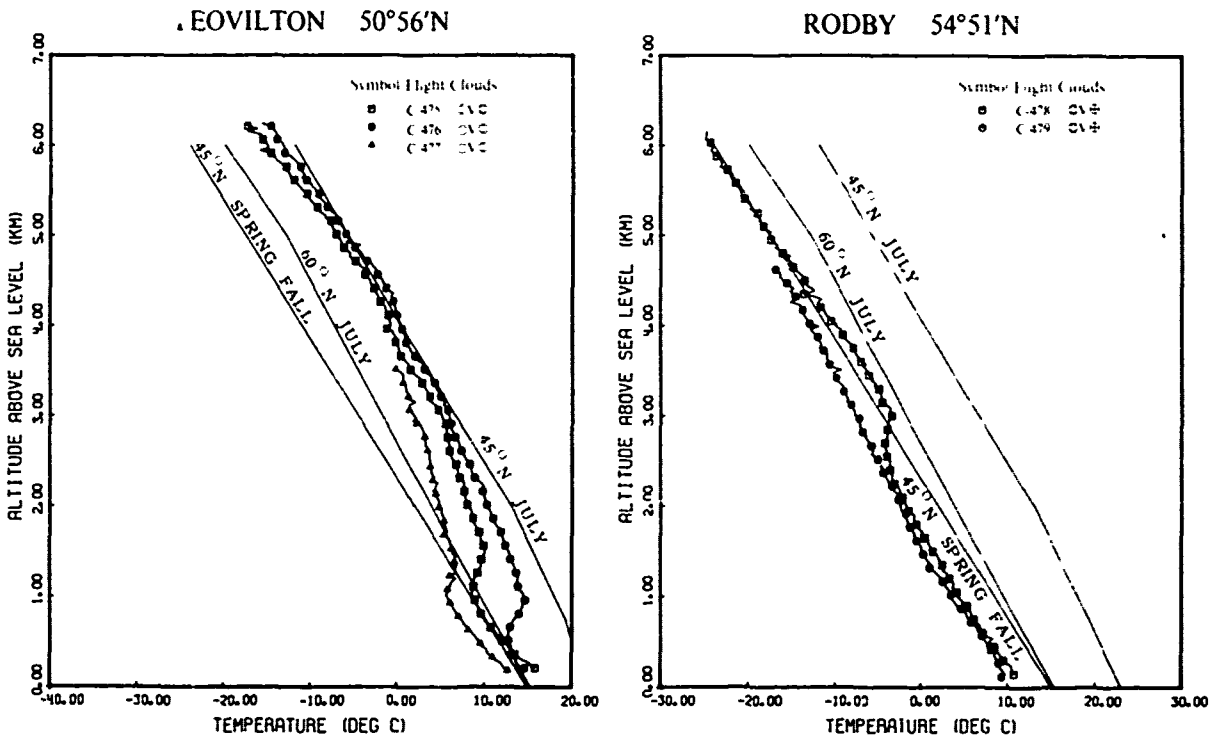


Fig 8-1 (con't.) Temperature for OPAQUE V Flights from 2 August to 26 September 1978 Compared to Temperature from U S Standard Atmosphere Supplements (1966)

The hygrometer channel registered a signal with a high frequency oscillation at mid-altitude in the descents of about half the flights. This high frequency noise has been deleted from the Relative Humidity profiles in Fig. 6-3. These portions of the profile appear as straight lines with no data symbols. The flights affected, were C-460, C-462, C-466, C-469, C-472, C-474, and C-478.

The graphs of the in-flight data on relative humidity in Fig. 6-3 give a measure of the expected level of temporal and spatial variability of the relative humidity over the time interval of the flight and over the flight track distance of approximately 48 kilometers (30 miles). It is reasonable for that variability to increase over a larger time interval and at distances greater than 50 kilometers. Also moisture layers can be expected to vary slightly in altitude with horizontal distance and time.

Comparison of the RAOB and in-flight relative humidity values for the three Soesterberg flights indicates good agreement with two exceptions: The RAOB does not show the high humidity layer at 1 kilometer on C-467 and the smaller altitude-interval low humidity layer just above 1 kilometer on C-469. These two features, consistently encountered on the flight track, were not sensed by the nearby RAOB. For all the other flights the RAOB station was more than 100 kilometers from the flight track so significant differences could be expected.

The relative humidity profiles for the Trapani flights C-460 through C-463 initially decrease in humidity above the surface layer, and remain at relatively low humidities until 3 kilometers altitude.

This is consistent with the upper air subsidence indicated by the temperature profiles. The remainder of the flights have higher humidities in the lower troposphere. All the northern European flights have at least one high relative humidity layer (80 percent or above) in the 0 to 3 kilometer regime.

Four flights have upper altitude data (data above 3 kilometers altitude) which seem to indicate the possibility of hysteresis problems with the hygrometer. The data measured during ascent for Filters 2 and 4, while indicating a decreasing frostpoint temperature with time, are higher at each given altitude than the data measured during descent for Filters 3 and 5, which indicate frostpoint temperatures increasing with time. These flights are C-472, C-475, C-476 and C-478.

While it is not unusual to observe large spatially or temporally induced variations in relative humidity, there appears to be a systematic disparity between the flight's four humidity profiles which occurs as the frostpoint temperatures become very low, *i.e.* -30°. A plausible explanation for this apparently systematic effect would be the retention of residual moisture within the Cambridge 137 sampling cavity as a result of incomplete purging as the aircraft enters these high, relatively dry regions.

The relationship of total volume scattering coefficient values to relative humidity will be dealt with in the section on scattering coefficient.

MIXING RATIO

The mixing ratio is defined as the ratio of the density of water vapor to the density of dry air. Thus it tends to be a conservative property which eliminates the effect of the decrease of density with altitude. The equation for the mixing ratio w is

$$w = \frac{{}_{w}M\ {}_{s}P({}_{d}t)}{{}_{a}M\ [P - {}_{s}P({}_{d}t)}\ . \tag{8.1}$$

where the mass per mole of water ${}_{w}M = 18.01534$ g/mol, the mass per mole of dry air ${}_{a}M = 28.9644$ g/mol, ${}_{s}P({}_{d}t)$ is the ambient vapor pressure, which is equal to the saturated vapor pressure at dewpoint temperature, and P is the ambient pressure. Since the ambient pressure is on the order of one hundred times the vapor pressure, Eq. (8-1) can be simplified to

$$w = 0.622\ {}_{s}P({}_{d}t)/P\ . \tag{8-2}$$

The average mixing ratio as a function of altitude above sea level for each flight is graphed in Fig. 8-2.

In the first kilometer of altitude, the mixing ratio for all the flights has a relatively small range of 5 to 10 g/kg. There is great diversity in mid-altitude with a general decrease in the maximum, until at high altitude the range narrows slightly from a factor of 10 to a factor of 6.

The mixing ratio will be discussed in relationship to the volume scattering coefficient in the next section.

OPAQUE V SUMMER 1978

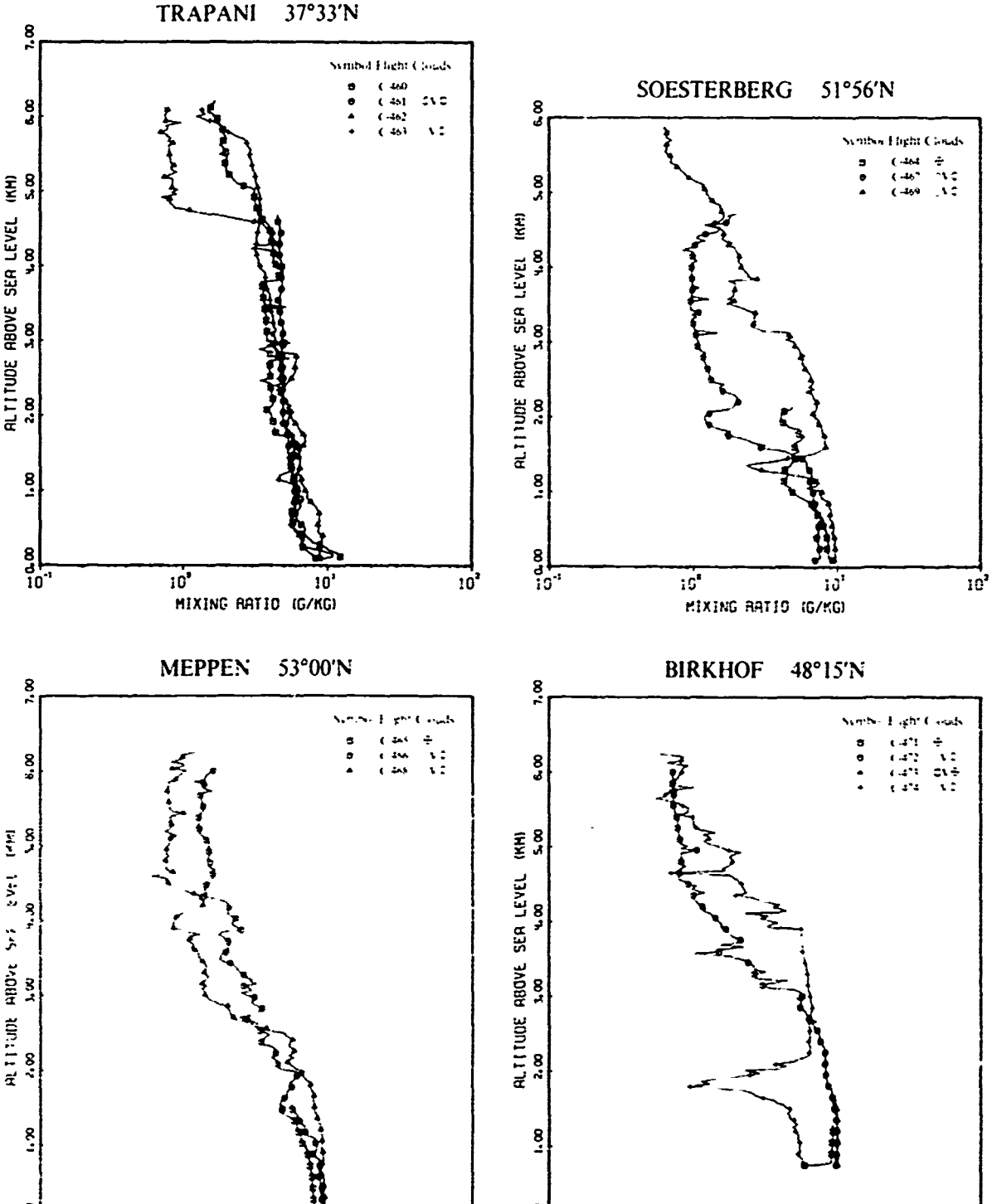


Fig. 8-2 Water Vapor Mixing Ratio w, for OPAQUE V Flights from 2 August to 26 September, 1978

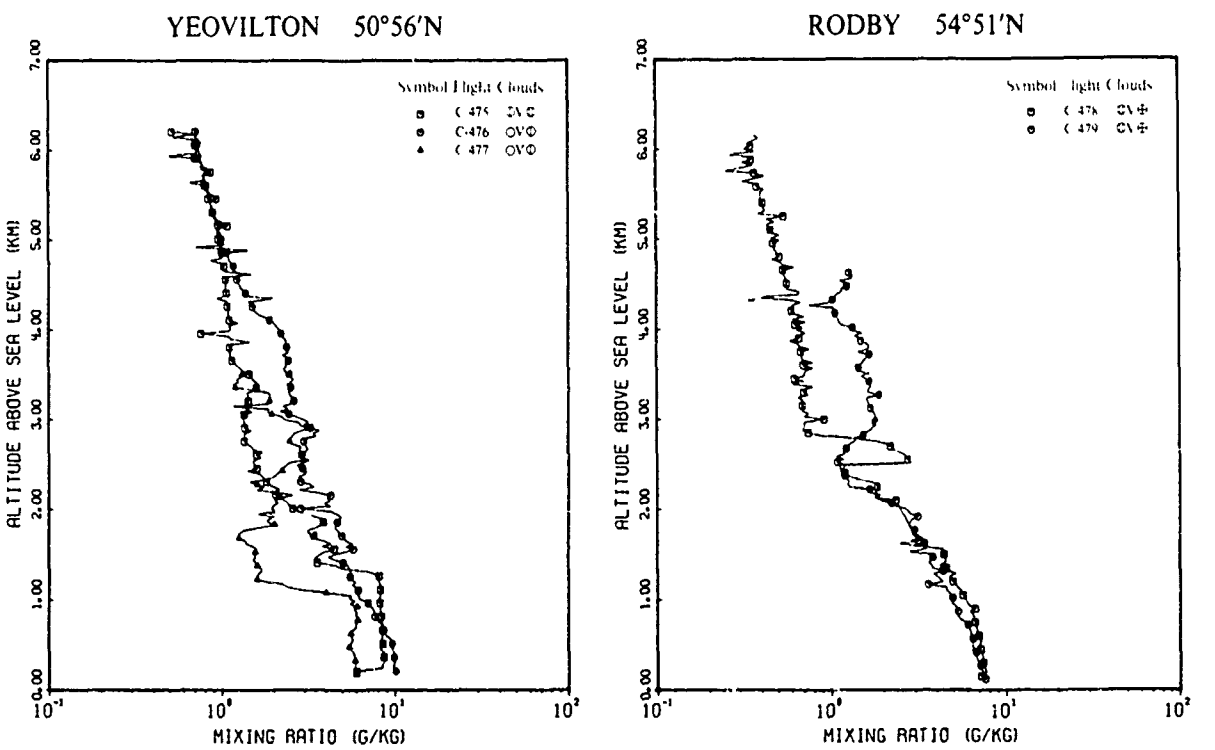


Fig 8-2 (con't) Water Vapor Mixing Ratio, w, for OPAQUE V Flights from 2 August to 26 September, 1978

8.2. AIRBORNE RADIOMETRIC DATA

TOTAL VOLUME SCATTERING COEFFICIENT

The altitude profiles of total volume scattering coefficient have been edited to delete or offset the data affected by the biasing square wave offset described in Section 3.1. The deletions are not very apparent in the graphs in Section 7.3 except as straight line sections of the profile. However, in Fig. 8-7 presented later in this section they appear as sections with no data symbols and are therefore easier to recognize. The entire profile for Filter 5 flight C-475 was deleted and the Filter 5 data for C-478 are considered marginal above 3 kilometers.

The nephelometer was known to have stray light problems during the OPAQUE I, II and III deployments which affected both the total volume scattering coefficient measurement and the volume scattering function measurement at 150°. In order to determine if the same stray light correction was applicable, the OPAQUE V nephelometer data were subjected to the same analysis as the OPAQUE I, II and III data. A description of the procedure is discussed on pages 8-5 through 8-12 of Duntley, *et al.* (1977), pages 8-5 through 8-7 of Duntley, *et al.* (1978a), and pages 8-5 through 8-6 of Duntley, *et al.* (1978b).

A further analysis of the OPAQUE V data indicated that although the volume scattering function data at 30° often seemed low relative to the total scattering coefficient values measured during the high altitude straight and level flight intervals, the previously used correction did not yield satisfactorily consistent results.

Figure 8-3 contains a graph of the low-altitude, measurements in the form of the ratio of the volume scattering function to the Rayleigh volume scattering function at the same scattering angle β, $\mathcal{Q}(z) = \sigma(z,\beta)/_R\sigma(z,\beta)$ versus the optical scattering ratio $Q(z)$. The optical scattering ratio is equal to the total volume scattering coefficient divided by the Rayleigh volume scattering coefficient, $Q(z) = s(z)/_R s(z)$. The superimposed curves are based on the mean values of the ten gradual volume scattering functions from Barteneva (1960). This comparability to Barteneva is similar to that previously found for data prior to OPAQUE [see Figs. 5-1 and 5-2 from Johnson *et al.* (1979)].

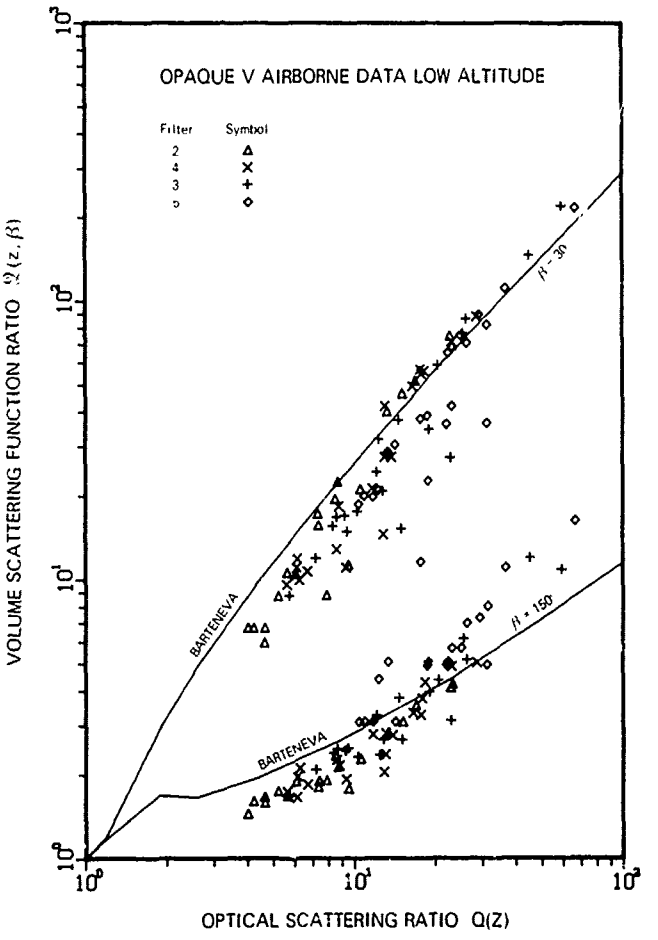


Fig 8-3 Low Altitude Nephelometer Directional Scattering Data for OPAQUE V Flights from 2 August to 26 September, 1978

The high as well as low and intermediate altitude volume scattering functions at 150° are plotted in a similar graph in Fig. 8-4. The Filter 5 data are not shown since the volume scattering function measurements at 150° were near the noise level of the system for Filter 5. Although there is slightly more scatter than at low altitude, the comparison with Barteneva is still reasonable.

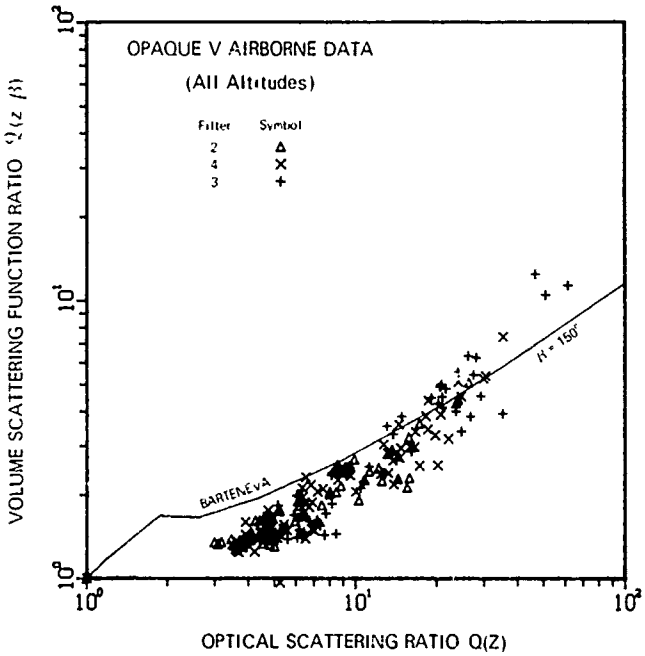


Fig 8-4 All Altitude Nephelometer Directional Scattering Data for OPAQUE V

In an attempt to more fully assess the performance of the nephelometer in its current configuration, the ground-based data were processed in a manner similar to the airborne, since the ground-based instrument is a direct copy of the airborne instrument. These data are graphed in a similar form in Fig. 8-5. Again, as with the low altitude airborne data, the volume scattering function for 30° and the total volume scattering coefficient are in good agreement with the Barteneva curve for all four filters over the total range of Q encountered.

The analysis summarized in the paragraphs above indicated that whereas the stray light correction applied to the earlier OPAQUE I, II, and III data was inappropriate for use with the OPAQUE V data set *i.e.* its application often yielded an over correction to the measured values of scattering coefficient, there was still an unexplained ambiguity in the high altitude measurements that was similar in nature to that seen in the earlier data sets. **However, since the specific nature of the problem was not fully resolved, it was decided that no stray light correction would be applied to the OPAQUE V data set.**

Continuing analysis, based upon the measured values of the directional scattering function and upon the high altitude measurements of upper hemisphere radiance distributions, has indicated that the OPAQUE V directional scattering function data may be correct rather than too low, and that the high altitude measurements of the total volume scattering coefficient above the primary haze layer may be systematically too high by as much as a factor of two at six kilometers. Additional studies are in progress to validate this initial contention, and to determine the magnitude and form of the most appropriate corrective procedure.

General Evaluation. The data reported for total volume scattering coefficient were measured during the vertical profile flight elements. Since three different flight patterns were used during OPAQUE V, they are summarized in Table 8.2. The first pattern listed is a (2+4) profile, two filters at

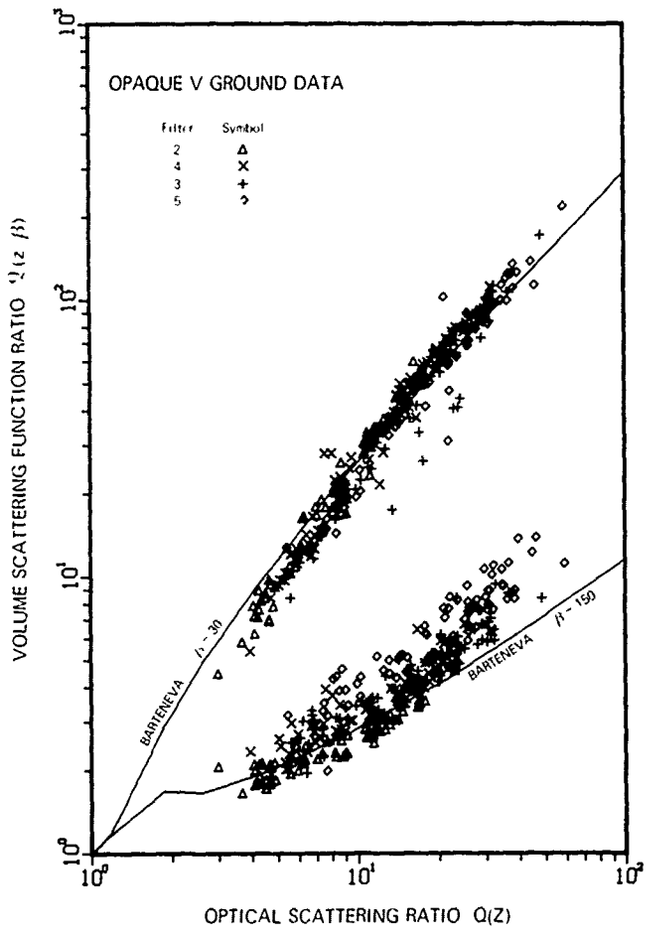


Fig 8-5 Ground Based Nephelometer Directional Scattering Data for OPAQUE V
2 August to 16 September, 1978

four straight and level altitudes, with the vertical profile during ascent for the first filter, and during descent in the second filter. This flight pattern was illustrated in Fig. 4-1. The maximum altitude varied with the flight pattern as noted in column 3, Table 8.2. The elapsed time also varied according to flight pattern and altitude interval and these averages are given in column 4.

Table 8.2. Flight Patterns Used During OPAQUE V

Pattern	Description	Maximum Altitude (meters)	Average Elapsed Time		Flights
			Hours	Minutes	
2+4	Two filters at four straight and level altitudes	5700	1	44	C-460(Filter 4*),C-461 (Filters 2,3) C-462,C-463 C-466 C-467,C-468,C-469,C-472 (Filters 2,3) C-474 C-475, C-476,C-478,C-479
2+3	Two filters at three straight and level altitudes	4500	1	23	C-460(Filter 2+),C-461(Filters 4,5), C-472(Filters 4,5),C-477
2+2	Two filters at two straight and level altitudes	1200		38	C-464,C-465 C-471 C-473

*Descent Filter 5 has only two straight and level altitudes These are concurrent with Filter 4
+ Descent Filter 3 has only two straight and level altitudes These are concurrent with Filter 2

The data have been extrapolated upward to the nearest 300-meter altitude increment for each filter. These upward extrapolations are based upon the density ratios of the *U. S. Standard Atmosphere,* (1962) (equivalent to the 45°N Spring/Fall). The extrapolations appear on the graphs of total volume scattering coefficient as a slightly slanting dashed line. The upward extrapolations generally follow the prevailing trend of the data, and are over small altitude intervals. However, the extrapolation for the flights with upper level haze or moisture layers are somewhat suspect and should be used with caution; these include flights C-464 and C-479.

For simultaneous data, the order of the scattering coefficient data by filter generally should be the inverse of the mean wavelength of the filters, *i.e.*, $s(\text{Filter 2}) > s(4) > s(3) > s(5)$. Although the data were not simultaneous, the data above 3 kilometers on the high altitude flights historically tend to follow this order except when upper level haze or moisture layers are encountered. This is generally true for all the flights but C-461 C-464, C-466 and C-478.

Two additional diagnostics used for comparing the nephelometer data by filter are to graph the Mie volume scattering coefficient and the optical scattering ratio Q as a function of altitude as is illustrated in Fig. 8-6 for flight C-468 at Meppen. The Mie volume scattering coefficient ${}_M s(z)$ is obtained from the total volume scattering coefficient $s(z)$

$$ {}_M s(z) = s(z) - {}_R s(z) , \tag{8-3} $$

where ${}_R s(z)$ is the Rayleigh volume scattering coefficient for that filter and altitude (based on measured pressure and temperature). The optical scattering ratio $Q(z)$ is

$$ Q(z) = s(z)/{}_R s(z) . \tag{8-4} $$

The Mie volume scattering coefficient should decrease with mean wavelength of the filter therefore ${}_M s(\text{Filter 5}) < {}_M s(3) < {}_M s(4) < {}_M s(2)$. In contrast the optical scattering ratio should be in the opposite order Q(Filter 2) < Q(4) < Q(30 < Q(5). Both these graphs were generated for each OPAQUE V flight. In general, the graphs followed the expected filter order except for small anomalous altitude intervals often associated with haze or moisture layers.

Figure 8-6 illustrates the typical case where the separation between the data by filter is smaller for the Mie volume scattering coefficient than it was for the total scattering but in the same filter order. In contrast, the filter separation for the optical scattering ratio tends to be the same or larger than for the total scattering as well as it is in the reverse order by filter. Thus in the altitude regions where the Mie scattering is very similar for the four filters (low altitude for C-468) the graph for optical scattering ratio separated the data nicely and in the proper order.

Note the slight but steady increase of $Q(z)$ with increasing altitude in the relatively clear air above the haze layer. This negative slope occurs in the data from all of the high altitude northern European flights. It was not present, however, in the upper altitude data for any of the Trapani flights. This negative slope may be indicative of a systematic error introduced by the method used for determining altitude. This error, which is temperature dependent and cumulative in nature, could

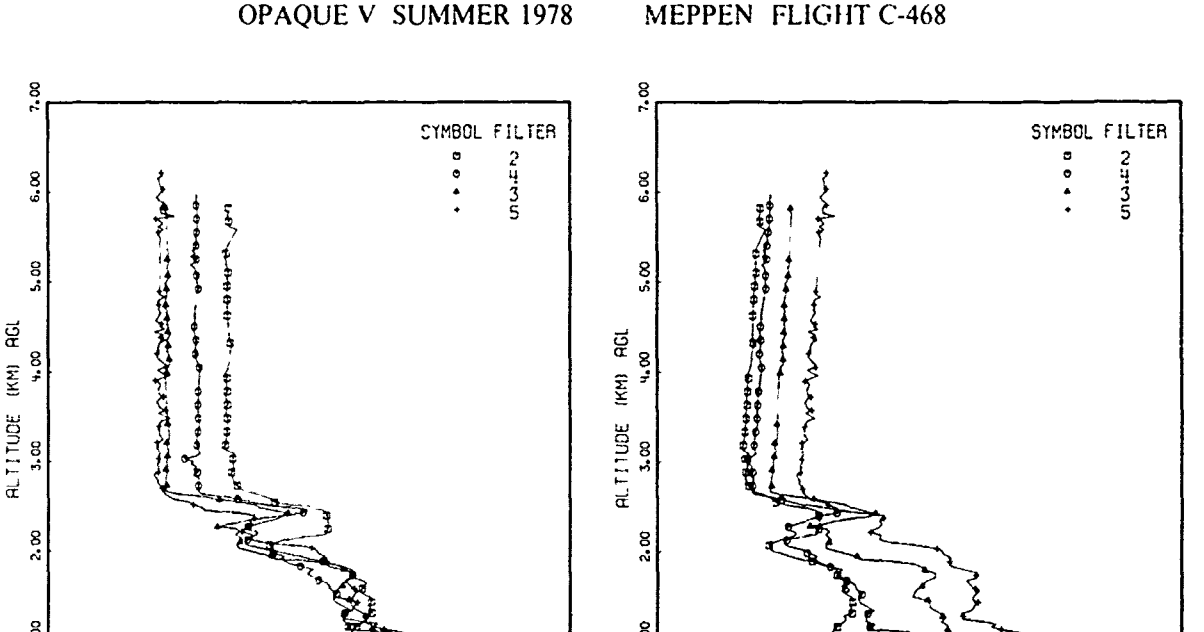


Fig 8-6. Mie Volume Scattering Coefficient and Optical Scattering Mixing Ratio as Functions of Altitude for OPAQUE V Flight C-468, Meppen, Germany 21August 1978

cause an increasing departure of the indicated altitude from the correct value, particularly in the cooler conditions encountered during the northern European flights. Evidence for such an error is apparent in systematic differences observed between the RAOB and in-flight measurements of both temperature and frostpoint temperature, as well as in the slight increase of $Q(z)$ with altitude.

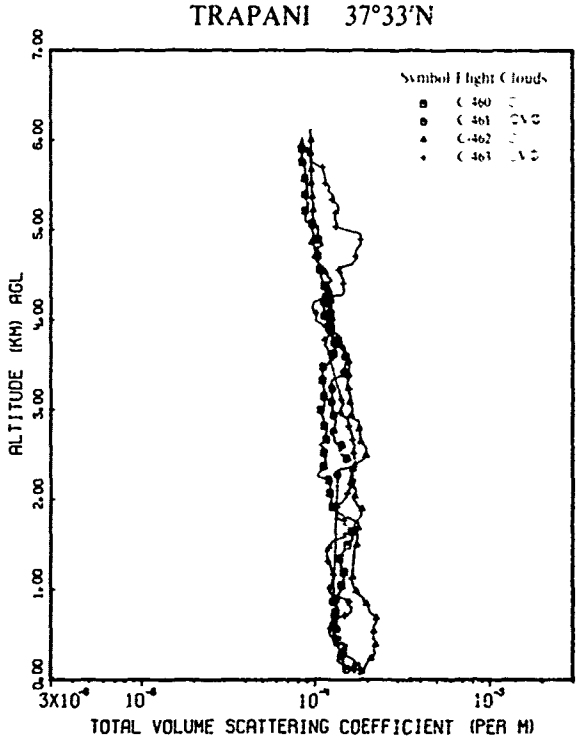
To more easily compare the scattering characteristics of the flights, the Filter 4 (pseudo-photopic) total volume scattering coefficient profiles for each flight have been graphed in Fig. 8-7. The flights are graphed by flight track and are in general chronological order except for the Meppen flights.

The Trapani data are clearly different from the rest of the flight profiles. The Trapani total volume scattering coefficients stay relatively high all the way up to 6 kilometers with no pronounced haze structure. The other flights generally show heavy haze below 2 kilometers and a fairly clear upper altitude region above except for the high altitude layer encountered during flight C-479.

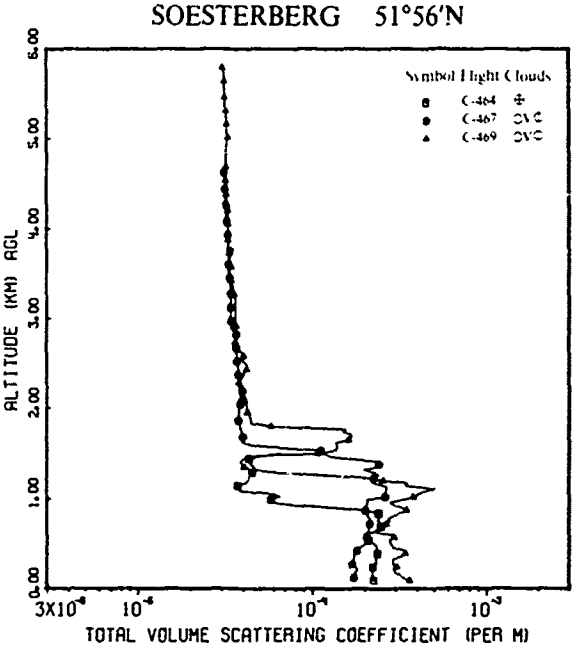
These differences in scattering coefficient profile, between the Trapani and the northern European flights, are consistent with the differences in the temperature and relative humidity profiles as well. The Trapani flights had a sharp, very low altitude temperature inversion followed by an increased temperature lapse rate indicative of strong subsidence. The northern European flights, in contrast, had reasonably standard temperature lapse rates with small inversions at the top of the low altitude haze

OPAQUE V SUMMER 1978

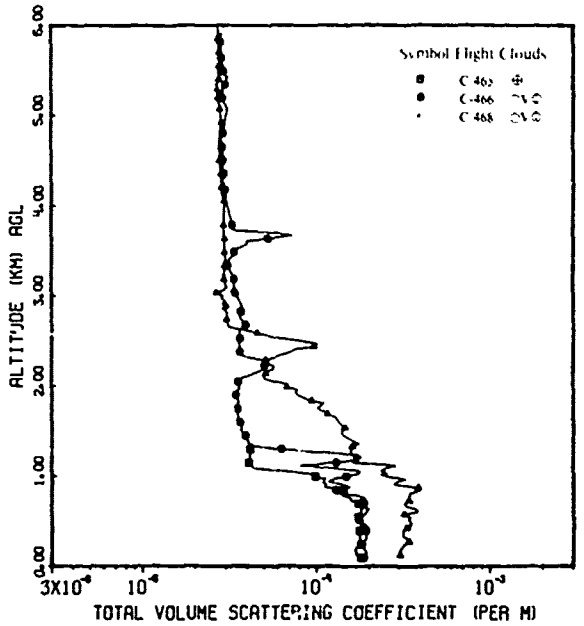
TRAPANI 37°33'N



SOESTERBERG 51°56'N



MEPPEN 53°00'N



BIRKHOF 48°15'N

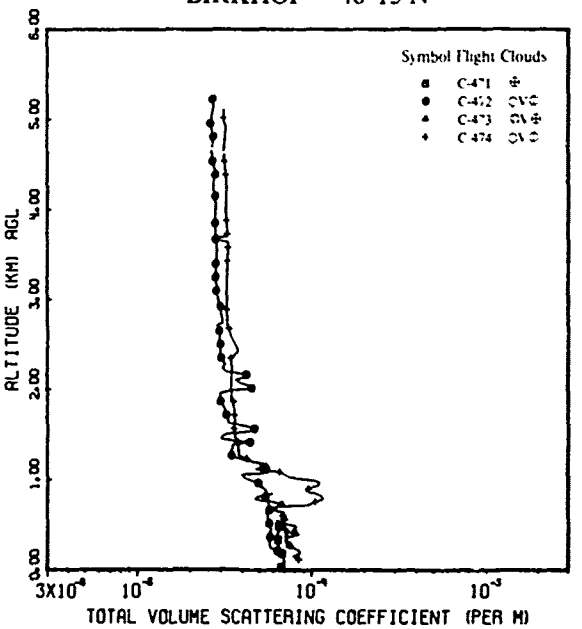


Fig 8-7 Airborne Nephelometer Pseudo Photopic Profile Data for OPAQUE V Flights from 2 August to 26 September, 1978

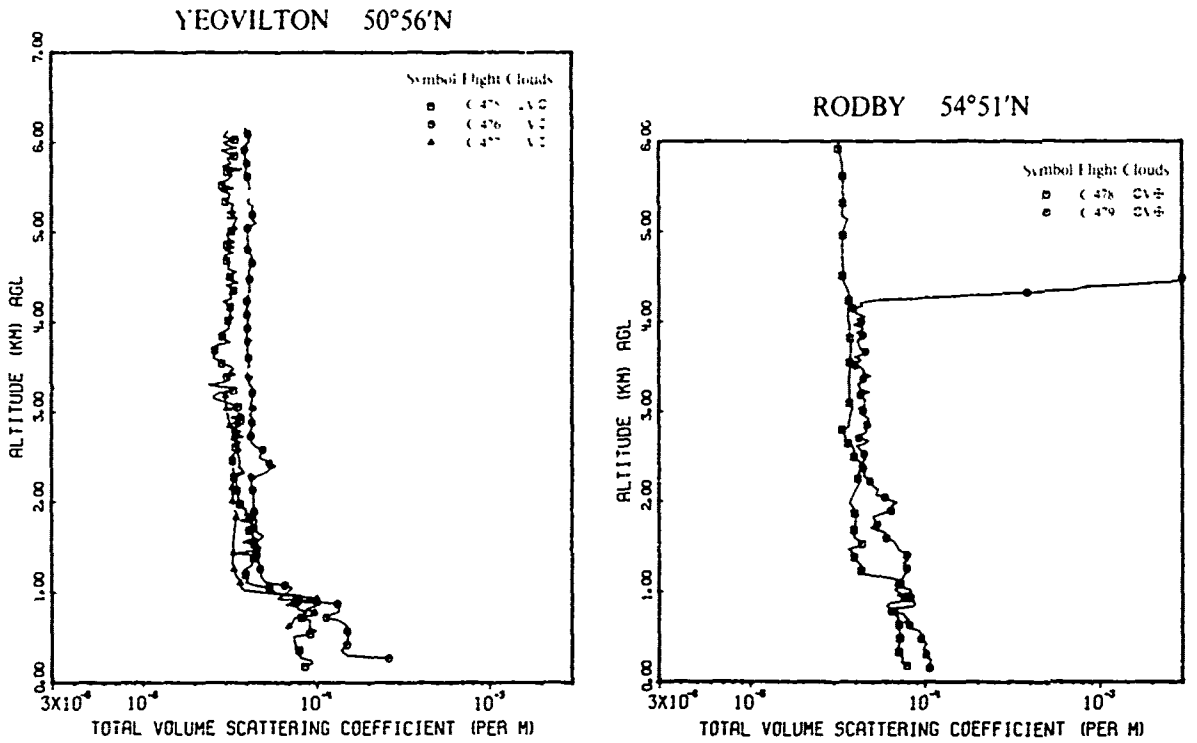


Fig 8-7 (con't) Airborne Nephelometer Pseudo Photopic Profile Data for OPAQUE V Flights from 2 August to 26 September, 1978

layer. The typical Trapani relative humidity profile indicated a decrease in relative humidity from the surface to the temperature inversion well below 1 kilometer, then a gradual increase to a high humidity at 4 to 5 kilometers in altitude. On the other hand, the northern European flights typically had high humidity in the low altitude haze layer up to 1, 2 or 3 kilometers altitude and then low humidities from 3 to 6 kilometers in altitude.

Clear layers above 3 kilometers have been noted for many of the flights during all the OPAQUE deployments. A comparison of the range of total volume scattering coefficient values during each OPAQUE deployment is given in Table 8.3. The Sicily flights during OPAQUE V encountered a hazier atmosphere in the upper altitudes than had been found on any of the previous OPAQUE deployments throughout all of Europe. The northern European flights during OPAQUE V found the upper altitudes to be relatively clear, similar to the atmosphere during the OPAQUE III July flights, but with a narrower range more similar to vinter/spring flights of OPAQUE IV at the same latitudes.

Low Altitude Data. The total volume scattering coefficient data in the lower altitudes tend to be substantially more complex than the data measured at higher altitudes. This complexity is particularly evident in the regime below about 1.5 to 2.0 kilometers. In this region there are often one or more distinct haze layers, in addition to spectral irregularities seldom found at the higher altitudes. To illustrate the typical complexities found in these low altitude data, the total volume scattering coefficient profiles for all nineteen OPAQUE V flights were replotted on an expanded vertical scale. From these,

Table 8.3. Comparison of the Clear Layer Upper Altitude Total Volume Scattering Coefficients for Filter 4 Mean Wavelength 557 nm

OPAQUE Data Set	Season	Approximate Latitude (degrees)	Total Volume Scattering Coefficient (m^{-1})	
			Minimum	Maximum
I	Spring	51°N - 55°N	1.2E-5	7.0E-5
II	Fall	48°N - 55°N	1.2E-5	7.0E-5
III Jul	Summer	48°N - 55°N	2.0E-5	6.0E-5
Aug	Summer	53°N - 55°N	4.0E-5	1.2E-4
IV	Winter	37°N - 00°N	1.6E-5	6.5E-5
	Winter	48°N - 52°N	2.2E-5	3.5E-5
	Spring	52°N - 55°N	2.9E-5	8.0E-5
V	Summer	37°N - 00°N	9.0E-5	2.0E-4
	Summer/Fall	48°N - 55°N	2.5E-5	4.5E-5

the four flights shown in Fig. 8-8, were chosen for display as typical of the general low altitude classifications listed in Table 8.4.

The classifications listed in Table 8.4 are of course quite broad, but in general, sort the profile data into several common sets. These sets range from the Type I unstructured and neatly spectrally ordered profiles used in many modelling approximations, to the Type IV strongly structured and spectrally cluttered profiles indicative of highly non-uniform and unstable aerosol conditions.

The four Trapani flights, C-460 through C-463, which encountered strong subsidence in a typically marine environment, all have low altitude scattering profiles of Type I. The northern European flights, on the other hand, fall in all four categories.

The distribution of the profile data within these general classifications becomes particularly significant whenever the data application involves inclined lines of sight contained within this low altitude regime. The erroneous assumption that the low level atmosphere is always a well behaved Type I environment may easily result in the computation of severely misleading values of path radiance and/or contrast transmittance.

Table 8.4. Preliminary Classification of Low Altitude Scattering Coefficient Profiles

Classification	Class Description	Flight No	Cumulative OPAQUE I thru V
Type I	No large, abrupt haze layer No spectral cross-over between profiles	460 463 461 471 462 473	10
Type II	No large abrupt haze layer Numerous spectral cross-overs between profiles	472 478 479	26
Type III	Moderately abrupt haze layer Numerous spectral cross-overs between profiles	467 475 468 476 474 477	29
Type IV	Large abrupt haze layer Numerous spectral cross overs between profiles	464 466 465 469	13

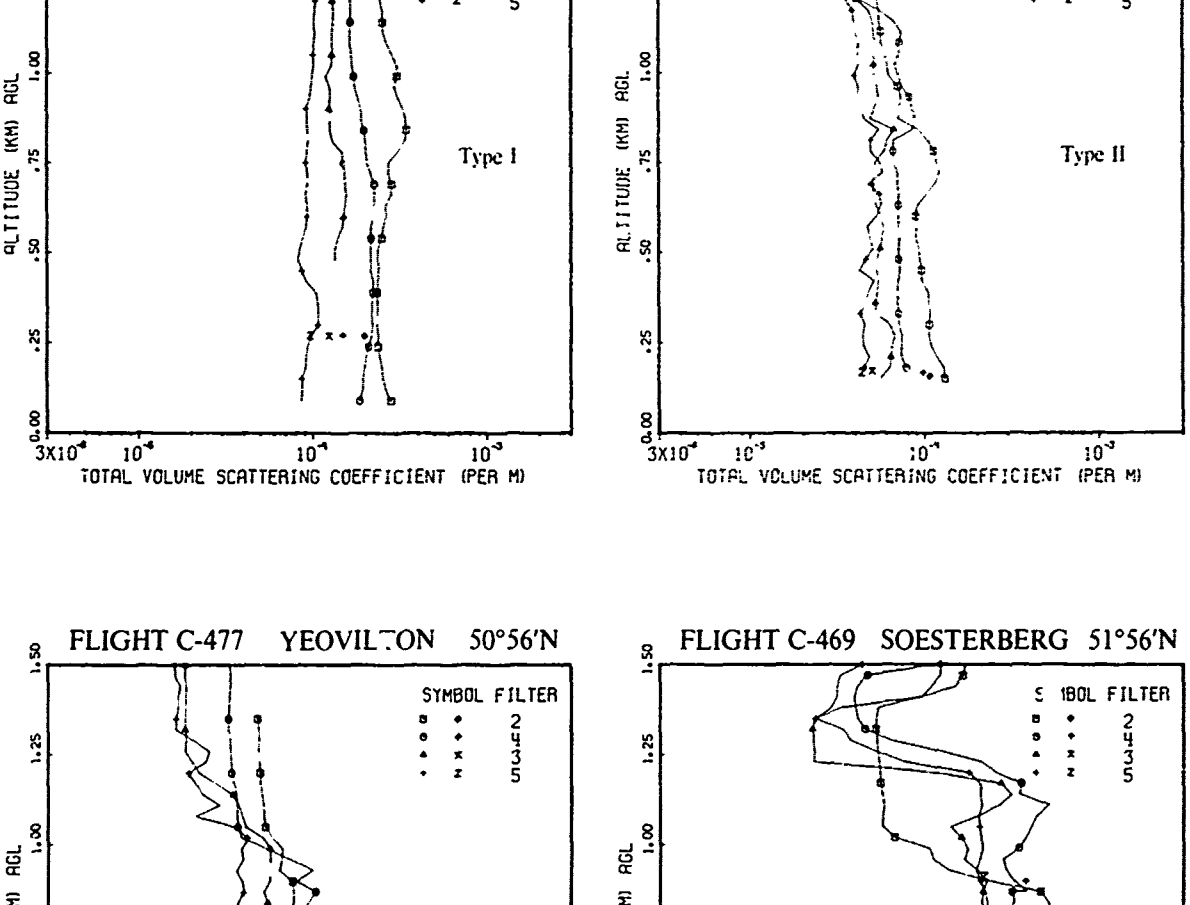


Fig 8-8 Low Altitude Volume Scattering Coefficients for Type I through Type IV Profiles

It is interesting to note that the nineteen OPAQUE V flights show a relatively even distribution among the four low altitude general classifications. Both the well behaved Type I profiles, as typified by flight C-462, and the abruptly layered Type IV profiles typified by flight C-469 were well represented. Each of the four types of low altitude profiles occurred during the five OPAQUE deployments. The cumulative occurrence is listed in the right hand column of Table 8.4.

Whenever the measurements at the lowest altitude indicate some irregularity, such as being out of the anticipated spectral order, *i.e.* not varying inversely with wavelength as illustrated by flight C-476, then any downward extrapolation of the data will reflect a continuation of this offset. Since both the equivalent attenuation length and the radiance transmittance are calculated between ground level and altitude, they are greatly influenced by these low altitude extrapolations, and thus will also reflect these spectral irregularities as illustrated in the plots of Section 7.

Users should be aware that the profiles illustrated in Section 7 and in Fig. 8-8 are both measured over a several hour period of time and over a 48 kilometer flight track, and thus the spectral and structural irregularities between them can be considered measures of the vertical, temporal and geographical non-uniformity of the aerosol.

General classifications, similar to those of Table 8.4, can also be used to sort the characteristics of the full 6 kilometer profiles illustrated in Section 7. Such classifications would help to define the optical stability and structural characteristics of the larger ground level to 6 kilometers environmental sample, a useful input to a variety of modelling applications. This overall structural classification of the entire OPAQUE data set is currently in progress, and is scheduled for presentation in a separate technical report.

Ground Level Data. Ground level measurements of total volume scattering coefficient were made from 2 to 7 August in Sicily, from 10 August to 21 August at Meppen, Germany, from 24 August to 13 September at Birkhof, Germany and 15 to 16 September at Yeovilton, England. Nine of these data sets at Meppen, Birkhof and Yeovilton were both concurrent with and near the flight track of nine of the 19 flights reported herein. The ground station in Sicily was too far from the flight track for those data to be used in conjunction with the airborne measurements over the water. The ground-based nephelometer values appropriate to each of the nine flights are in the tables and graphs in Section 7.

Extrapolations Downward to Ground Level. For the remainder of the flights total volume scattering coefficient data have been extrapolated from the lowest altitude measurement down to ground level. The extrapolations downward to ground level were based upon the density ratios of the *U. S. Standard Atmosphere*, (1962). All the downward extrapolations appear on the graphs of total volume scattering coefficient in Section 7-3 as dashed lines.

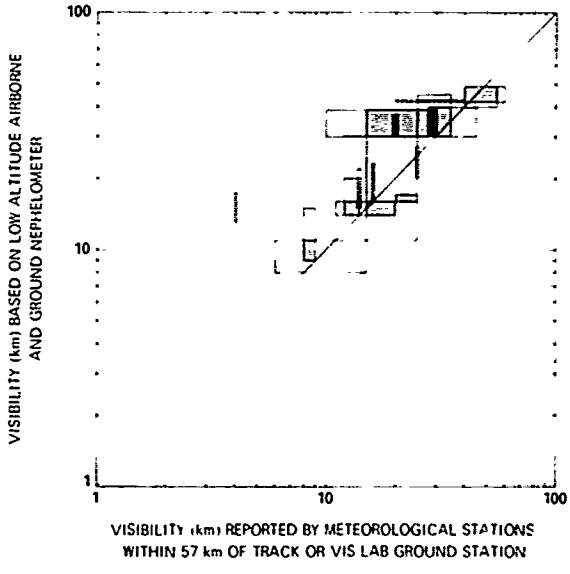
On all but one of the vertical profiles (flight C-462, Filter 3, Table 7.3) it was possible to make airborne measurements as low as 270 meters, and occasionally below 90 meters. Therefore all these downward extrapolations are for relatively small altitude intervals. The entries in Table 7.3 indicating zero altitude are all for flights on the Birkhof track. The ground level specified for the Birkhof site is only a nominal value associated with its plateau location. The zero altitudes are artifacts of flight profiles which extended into the nearby valleys below the arbitrarily assigned "ground level" associated with the reference ground site.

Comparison to Visibility. The meteorological estimates of horizontal visibility VV have been related to the attenuation coefficient α by Douglas and Young (1945), and hence may be related to the scattering coefficient in the absence of absorption by

$$VV = \ln 18/\alpha \approx 3/s \ . \tag{8.5}$$

Additional discussions of this relationship are presented by Middleton (1952) and Gordon (1979).

Visibility values based on Eq. (8.5) were computed from the ground level and lowest altitude nephelometer measurements. These have been graphed as a function of the visibility reported by meteorological stations within 57 kilometers of the flight track or ground station during the time span of the flight. This graph is presented in Fig. 8-9. The superimposed straight line indicates a one to one correlation. Although there is a broad spread to the data, the general trend is appropriate. The spread is probably not unreasonable in view of the spacial distances and temporal differences between the data sources. The spread in visually determined visibilities may also be partially due to availability of suitable markers and differences in visual acuity and/or training of observers.



*Note

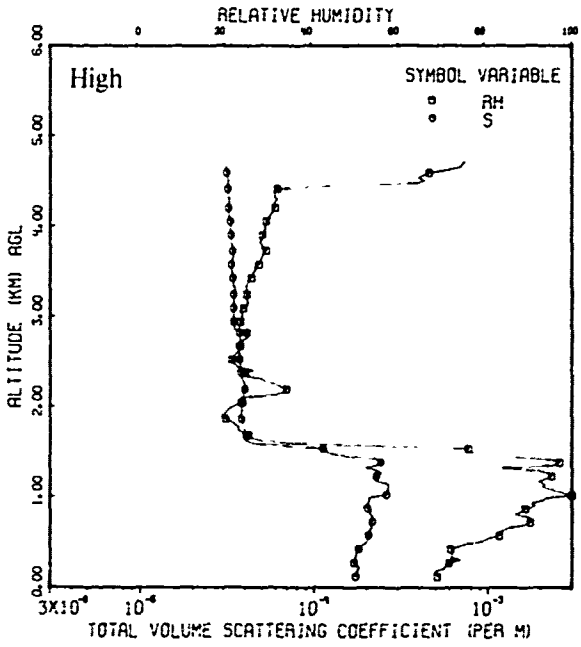
Each of the seventeen rectangles represents one flights time-space variability as induced by flight duration, station distance, and subjectivity of observer

Fig. 8-9 Comparison of Visibilities Derived from Nephelometer Data with Those Reported by Nearby Meteorological Stations

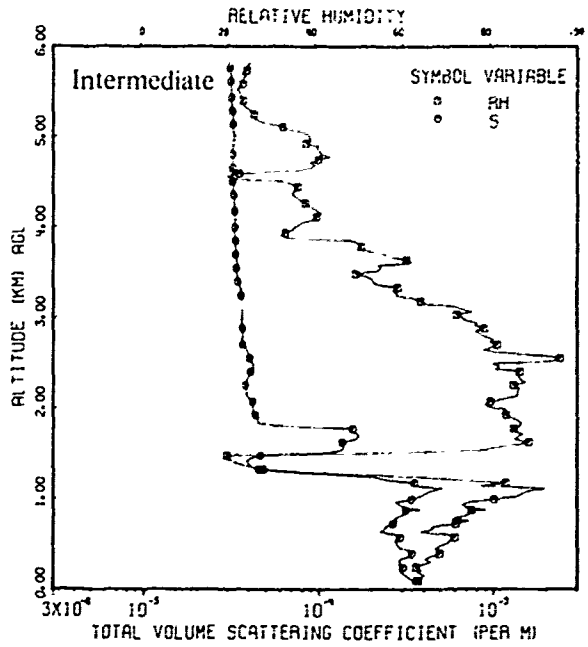
Composite Graphs of RH and s. A qualitative, though informative, comparison of the relative humidity and the total volume scattering coefficient measurements taken during the vertical profile flight elements may be made by examining the graphical displays of relative humidity in Section 6.1 and total volume scattering coefficient in Section 7.3.

A convenient method of assessing the degree of similarity, or the lack thereof, between the relative humidity profiles presented in Fig. 6-3 and the total volume scattering coefficient profiles presented in Section 7, is to use the composite plots illustrated in Fig. 8-10. In these automatically generated overlays one can readily determine the degree to which the two plots exhibit the same or

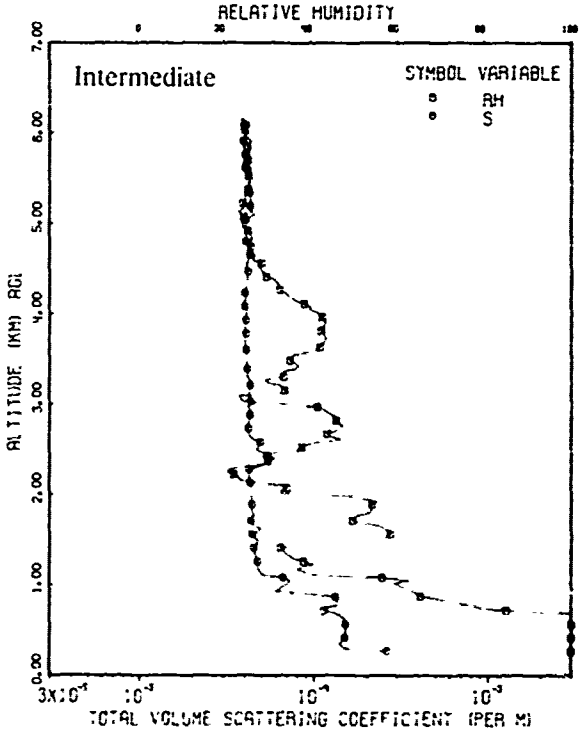
FLIGHT C-467 Filter 4



FLIGHT C-469 Filter 4



FLIGHT C-476 Filter 4



FLIGHT C-478 Filter 4

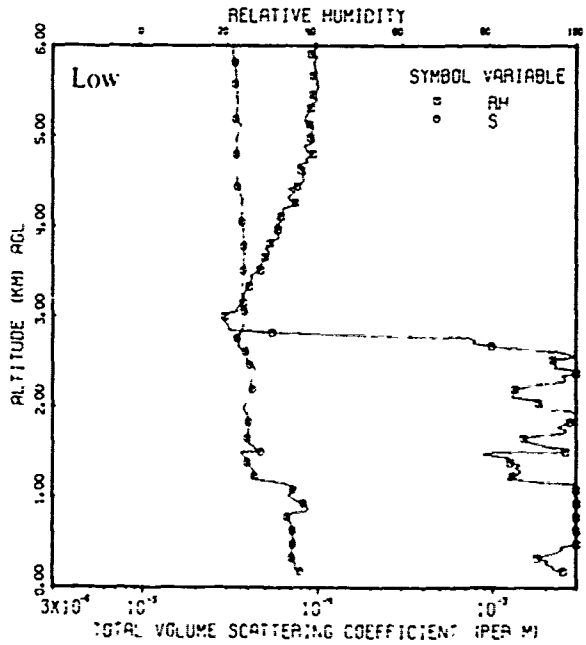


Fig. 8-10 Comparison of the Photopic Scattering Coefficient and Relative Humidity Profiles as Measured during Flights C-467, C-469, C-476, and C-478

similar structural characteristics. These paired plots of simultaneously recorded data sets represent an optimal display form and are proving useful in guiding the analyst toward the goal of determining a more clearly defined relationship between the measured optical and meteorological properties of the atmosphere. The increased use of these displays is accelerating our ability to select flights whose optical and meteorological characteristics are thoroughly enough documented to enable their confident use in studies aimed at establishing their linking relationships.

The examples shown in Fig. 8-10 were selected from nineteen pairs of profile data measured during the OPAQUE V Filter 4 pseudo-photopic ascents. These graphs were chosen to illustrate conditions exhibiting relatively high structural similarity throughout the total altitude interval (C-467), intermediate structural similarity (C-469 and C-476) and a low structural similarity (C-478).

It should be noted that the number of flights within this summer OPAQUE V set that show high structural similarity in these composite plots is substantially smaller than the number observed in the winter OPAQUE IV set, Johnson and Gordon (1979). Sixteen of the nineteen flights from OPAQUE V were rated intermediate or low in structural similarity, and those rated intermediate possessed similar features only at the primary haze tops and below. At the higher altitudes there were often broad excursions in the value of relative humidity with little or no variation in scattering coefficient. Alternative displays of these data in a format eliminating altitude effects are presented in the following section.

Correlation with Relative Humidity. Several graphical displays have been developed to aid the analyst to understand the correlation of the optical and meteorological properties of the atmosphere. To illustrate these displays we will use data from flight C-468 near Meppen, Germany on 21 August 1978. The optical data will be the total volume scattering coefficient $s(z)$ measured with the pseudo-photopic Filter 4. The meteorological data will be those parameters which can be derived from the values of ambient temperature $t(z)$ and dewpoint (or frostpoint temperature) ${}_{d}t(z)$ measured concurrently with the Filter 4 scattering coefficients during the vertical profile flight elements.

The first display was described in detail in the preceding section, the composite graph of Relative Humidity and total volume scattering coefficient for the pseudo-photopic Filter 4, both graphed as a function of altitude. This plot is given as graph *a* in Fig. 8-11.

The second display is a graph of the optical scattering mixing ratio $Q(z)$ [from Eq. (8.4)] as a function of relative humidity [from Eq. (2.10)]. This is given as scatter diagram *b* in Fig. 8-11. The function displayed is not monotonic and therefore it is difficult to use it to develop an understanding of the optical-meteorological correlation.

The third display is a graph of the Mie volume scattering coefficient [from Eq. (8.3)] as a function of the absolute humidity. The absolute humidity AH (or density of water vapor ${}_{w}\rho$) is computed from the measured ambient temperature t and the dewpoint (or frostpoint) temperature ${}_{d}t$ from the equation

$$AH = {}_{w}\rho = \frac{{}_{s}P({}_{d}t)\ {}_{w}M}{83.1432(t+273.15)} \quad . \tag{8.6}$$

where ${}_{s}P({}_{d}t)$ is the vapor pressure, which is equal to the saturated vapor pressure at dewpoint temperature, and ${}_{w}M$ is the mass per mole of water, which equals 18.01534g/mol. This diagram is

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MEPPEN FLIGHT C-468

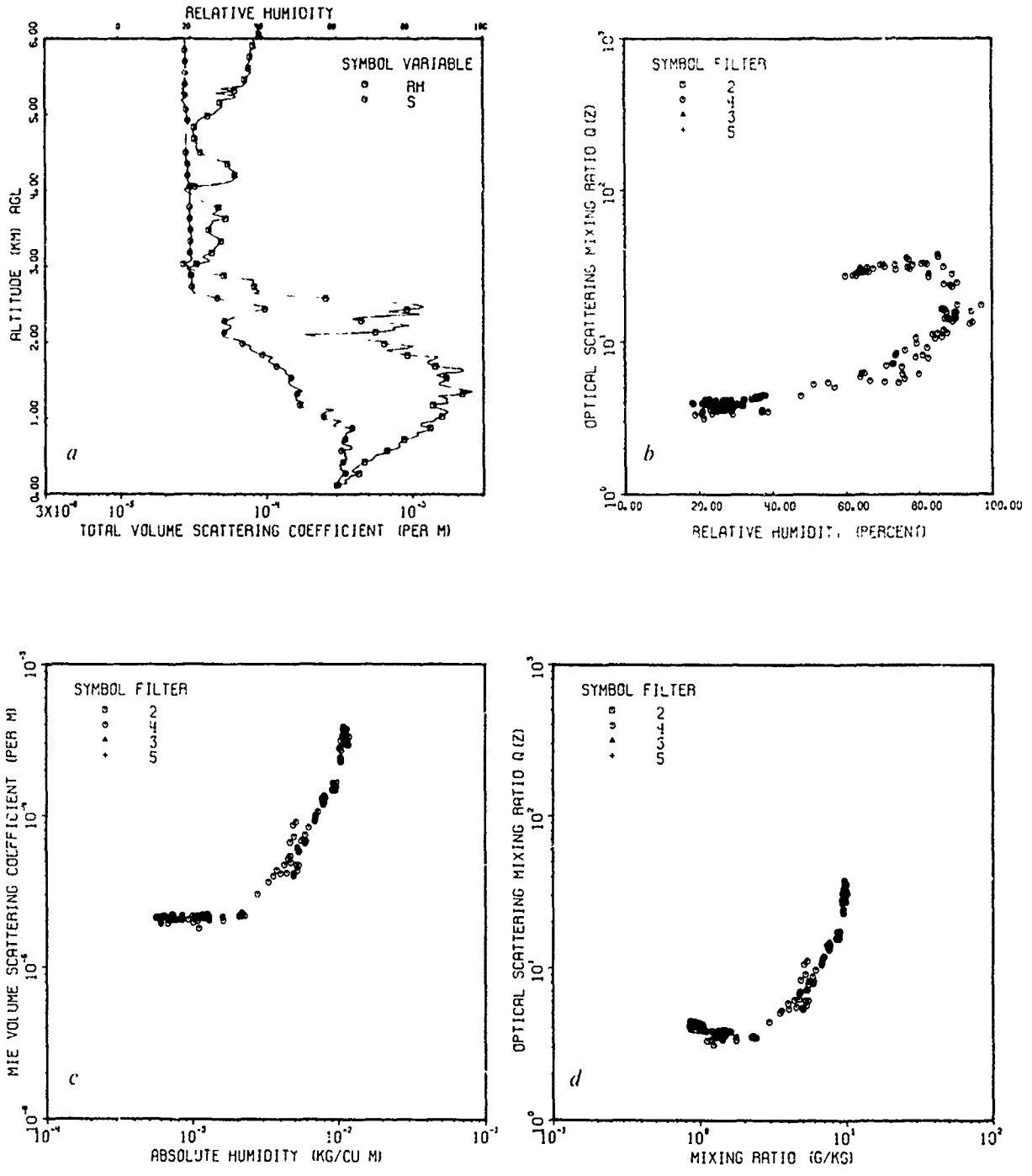

Fig. 8-11 Correlation of Pseudo Photopic Optical and Meteorological Atmospheric Properties for Flight C-468, 21 August 1978.

presented as graph *c* in Fig. 8-11. These data now describe a fairly well defined function. The question arises, however, as to how much of the apparent functional relationship is due to density change with altitude.

The fourth display uses conservative optical and meteorological properties. The optical scattering mixing ratio $Q(z)$ can also be expressed as

$$Q(z) = \frac{s(z)}{_R s(o)} \frac{\rho(o)}{\rho(z)} . \tag{8.7}$$

where $\rho(z)$ is the density at altitude. The water vapor mixing ratio w is, to a first approximation,

$$w(z) = {}_w\rho(z)/\rho(z) . \tag{8.8}$$

Thus the optical scattering mixing ratio and the meteorological mixing ratio both eliminate the effect of the decrease of density with altitude. The scatter diagram of optical versus meteorological mixing ratio is given as graph *d* of Fig. 8-11. The data still describe a relatively tight function but the slopes are different from those in graph *c* in Fig. 8-11.

Optical versus meteorological mixing ratio scatter diagrams have been graphed on a common scale for all 19 OPAQUE V flights. Overlaying these graphs indicated that all the northern European flights displayed a similar functional relationship to that illustrated in Fig. 8-11d. The graphs for the Trapani flights, however, while similar to each other, were quite different from the graphs for northern Europe. This is consistent with the differences described earlier for the scattering coefficient, temperature and relative humidity profiles. To illustrate the difference in the Trapani and European data sets, these same four optical to meteorological displays are given for flight C-460 in Fig. 8-12. The data from this warmer, dryer flight indicate essentially no correlation between the optical and meteorological mixing ratio for mixing ratios in the range 1.5 to 10 g/kg. This is in contrast to the northern Europe flights which showed no correlation for mixing ratios .8 to 2.5 g/kg but a good correlation from 2.5 to 10 g/kg.

This display (illustrated in graph *d* of Figs. 8-11 and 8-12) of the functional relationship between the optical and meteorological mixing ratio appears promising and will be further pursued.

EQUIVALENT ATTENUATION LENGTH AND RADIANCE TRANSMITTANCE

Equivalent attenuation length is presented for the path between ground level and altitude. At ground level the equivalent attenuation length is the reciprocal of the total scattering coefficient $s(z)$. As altitude increases, the equivalent attenuation length shows the cumulative effect of summing $s(z)$ from ground level to altitude z.

The vertical radiance transmittance starts at 1.0 at ground level and shows the cumulative effect of the summation of the total scattering coefficient with altitude.

For simultaneous data, or even for sequentially sampled data under reasonably stable and uniform aerosol conditions, the order by filter of the equivalent attenuaton length $\bar{\Omega}$ and the radiance

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TRAPANI FLIGHT C-460

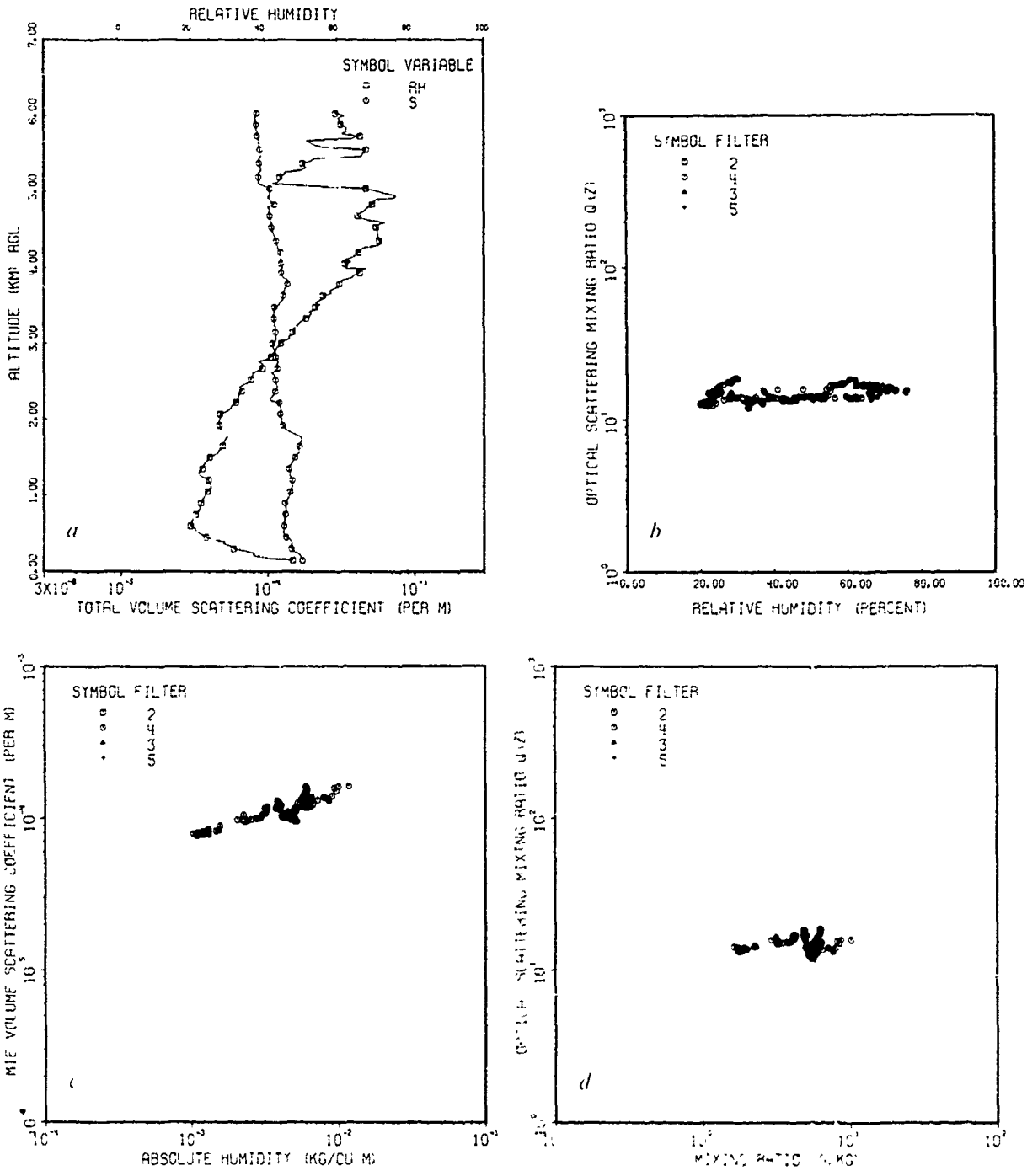

Fig 8-12 Correlation of Pseudo Photopic Optical and Meteorological Atmospheric Properties for Flight C-460 2 August 1978

transmittance should vary directly as the mean wavelength of the filters, *i.e.*, $\bar{\mathcal{L}}(\text{Filter 2}) < \bar{\mathcal{L}}(4) < \bar{\mathcal{L}}(3) < \bar{\mathcal{L}}(5)$. Twelve of the OPAQUE V flights show this regularity at all altitudes (C-460, C-462, C-465, C-467, C-469, C-471, C-472, C-473, C-474, C-475, C-477 and C-478) and four of the flights have attenuation length in order by filter at most altitudes (C-463, C-468, C-476, and C-479). Three flights are irregular at most altitudes (C-461, C-464, and C-466). Note that each of these three general classes of spectral regularity are represented in both the Trapani and the northern European data sets.

Equivalent Attenuation Length and Radiance Transmittance Examples. The equivalent attenuation length table can easily be used in Eq. (2.6) to obtain radiance transmittance for various zenith angles for the upward path of sight and for various zenith angles for the downward path of sight.

EXAMPLES

A. For an upward path of sight at 60-degree zenith angle, with an object altitude z_t at 4500 meters, Eq. (2.6) would be written

$$T_{9000}(0, 60°) = \exp\left\{\left[-4500\text{m}/\bar{\mathcal{L}}(4500)\right]\sec 60°\right\}.$$

Using the equivalent attenuation length for flight C-468 Filter 4, Eq. (2.6) becomes

$$T_{9000}(0, 60°) = \exp\left\{\left[-4500\text{m}/7990\text{m}\right]2\right\} = 0.324\,.$$

B. For a downward path of sight at a zenith angle of 105 degrees from a sensor altitude of 3000 meters, Eq. (2.6) would become

$$T_{11,590}(3000, 105°) = \exp\left\{\left[-3000\text{m}/\bar{\mathcal{L}}(3000)\right]|\sec 105°|\right\}.$$

Again using the values from flight C-468 Filter 4, Eq. (2.6) becomes

$$T_{11,590}(3000, 105°) = \exp\left\{\left[-3000\text{m}/5780\text{m}\right]3.864\right\} = 0.135\,.$$

IRRADIANCE

Downwelling. The downwelling irradiance was measured during the straight and level flight elements and during the vertical profiles on each flight. During the straight and level flight elements, the intended aircraft flight attitude was 2.5 degrees nose high and the dual irradiometer was oriented to be horizontal during a +2.5 degree pitch. The pitch and roll measurements, when available during the straight and level flight elements, indicated that average aircraft attitude was such that the dual irradiometer was within ±2.5° degrees of true horizontal during most of the flights.

Downwelling irradiance values for the straight and level flight elements for each flight are presented in columns 7 through 10 in Table 8.5. Some of the values are missing from the table since some of the lowest altitude straight and level data were affected by the purging problem discussed in

Table 8.5. Downwelling Irradiance Measured by Dual Irradiometer During Straight and Level Flight Elements OPAQUE V

Flight No	Average Altitude (meters)	Sun Zenith Angle (Degrees)				Downwelling Irradiance ($w/m^2/\mu m$)				Downwelling Irradiance/ Irradiance from Brown			
		Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5
C-460*	613	33.1	49.0	33.6	44.5	1510	1030	998	568	1.134	1.091	0.788	0.666
	3054	30.8	45.0		-	1720	1140			1.247	1.085		
	1836		42.6				1410	-	-	-	1.270	-	-
	272	20.6	39.1	21.1	39.3	86		1648		0.560	-	0.675	
C-461	4468	24.4	39.6	23.8	39.9	1770	1490	1230	899	1.188	0.982	0.629	0.582
	2450	27.5	39.2	26.7	39.0	1730	1310	1160	733	1.215	0.843	0.784	0.458
	1505	31.0	-	29.9		1450	-	1020		1.055	-	0.731	-
	280	36.3	21.3	35.1	21.0	-		-		-			
C-462	6150	24.2	23.9	23.6	24.5	1890	1520	1280	929	1.263	1.013	0.851	0.623
	3715	28.3	21.2	27.5	21.6	1790	1670	1210	46.	1.255	1.088	0.840	0.587
	1830	33.5	20.5	32.2	20.6	1550	1760	1090	955	1.172	1.136	0.808	0.617
	270	37.8	21.4	36.9	21.1		-		-		-		
C-463*	6095	22.2	26.9	21.9	27.6	1926	1530	1310	924	1.258	1.054	0.856	0.642
	3665	24.7	23.8	24.1	24.3	1830	1590	1270	868	1.229	1.058	0.848	0.581
	1830	27.9	21.6	27.1	21.9	1690	1490	1160	846	1.178	0.913	0.801	0.553
	280	31.7	21.1	30.9	21.2		-	-	-		-	-	-
C-464	1504	38.1	41.1	38.6	41.5	582	740	400	406	0.480	0.644	0.331	0.357
	270	37.7	39.5	37.8	40.0	175	486	462	420	0.386	0.409	0.376	0.357
C-465	5300	50.5	55.6	51.1	56.1	338	150	258	253	0.373	0.196	0.290	0.337
	250	48.0	53.1	48.5	53.6	416	249	439	192	0.428	0.299	0.457	0.233
C-466	5545	40.8	40.3	40.5	40.6	1410	1250	922	745	1.220	1.071	0.802	0.642
	3100	42.8	39.2	42.4	39.4	1360	1240	885	692	1.230	1.038	0.793	0.581
	1150	45.0	38.9	44.4	38.9	1430	1280	851	726	1.361	1.068	0.799	0.604
	235	47.1	39.4	46.5	39.2	1110		748	-	1.116		0.740	-
C-467	5417	40.2	39.2	40.5	39.9	1440	1060	926	580	1.231	1.130	0.796	0.629
	2575	39.2	46.3	39.4	47.1	1440	1370	979	614	1.298	1.348	0.822	0.616
	890	38.8	43.7	38.8	44.4	1360	1010	814	661	1.130	0.932	0.676	0.620
	257	39.1	42.1	39.0	42.6	1376	820	781	323	1.145	0.730	0.651	0.291
C-468	6038	42.5	41.9	42.3	42.1	1360	1190	909	728	1.222	1.054	0.812	0.648
	3111	44.5	41.0	44.1	41.1	1320	1250	854	715	1.241	1.086	0.796	0.622
	1386	46.5	40.9	45.9	40.8	1290	1250	772	703	1.277	1.083	0.752	0.609
	260	48.6	41.3	48.1	41.2	1010		778		1.058		0.803	-
C-469	5860	44.3	56.6	44.8	57.3	1370	921	899	516	1.284	1.248	0.851	0.717
	2510	42.1	52.7	42.4	53.5	1410	1010	865	516	1.226	1.195	0.776	0.623
	820	40.8	49.9	41.1	50.5	1530	1030	884	540	1.332	1.118	0.769	0.596
	280	40.3	47.1	40.4	47.5	1270	-	858		1.087	-	0.733	
C-471	535	61.2	56.0	60.3	55.3	369	377	150	260	0.603	0.501	0.235	0.336
	75	64.0	58.4	63.4	57.7	620	334	201	223	0.599	0.485	0.360	0.315
C-472	5315	51.0	46.2	51.1	46.7	1150	797	754	448	1.290	1.265	0.849	0.718
	3790	49.3	-	49.4		1180	-	747		1.258	-	0.800	-
	1950	47.7	56.8	47.8	56.9	1220	1060	783	557	1.244	1.445	0.801	0.765
	240	46.6	52.7	46.7	53.8	453	-	473	-	0.449	-	0.470	-

*Pattern of no pitch and roll information available

Table 8.5. (Cont.) Downwelling Irradiance Measured by Dual Irradiometer During Straight and Level Flight Elements OPAQUE V

Flight No	Average Altitude (meters)	Sun Zenith Angle (Degrees) Filter 2	Filter 4	Filter 3	Filter 5	Downwelling Irradiance (w/$m^2\mu m$) Filter 2	Filter 4	Filter 3	Filter 5	Downwelling Irradiance/ Irradiance from Brown Filter 2	Filter 4	Filter 3	Filter 5
C-473	855	75.7	74.1	69.0	74.9	139	134	280	88	0.576	0.485	0.696	0.342
	280	69.8	71.5	66.4	72.0	407	169	156	171	0.838	0.496	0.331	0.523
C-474	5485	45.5	47.4	45.3	47.8	1310	1130	873	626	1.264	1.154	0.838	0.640
	2875	47.3	49.1	47.0	45.5	1260	1150	814	759	1.273	1.099	0.815	0.731
	715	49.7	44	49.0	44.5	1330	1159	773	634	1.438	1.081	0.818	0.597
	270	51.8	44.5	51.1	44.5	911	768	860	625	1.049	0.723	0.969	0.587
C-475*	3093	52.9	68.0	53.6	69.1	1280		573	-	1.525	-	0.698	-
	927	50.6	64.5	51.1	65.3	1140		663	-	1.263	-	0.747	-
	327	49.3	61.0	49.6	61.6	1140		718		1.218	-	0.773	
C-476*	6188	48.5	56.2	48.6	56.9	1180	1120	776	488	1.230	1.497	0.811	0.670
	3105	48.5	53.3	48.3	53.8	1450	983	766	506	1.512	1.188	0.796	0.621
	1017	49.6	51.2	49.1	51.7	1400	747	742	614	1.506	0.844	0.788	0.704
	298	50.7	49.7	50.4	50.0	1020	1050	595	360	1.136	1.134	0.656	0.392
C-477	3481	49.2	50.9	49.1	51.2	1410	983	761	551	1.499	1.101	0.807	0.623
	632	49.7	49.7	49.6	50.0	1130	985	763	539	1.221	1.065	0.821	0.586
	318	50.7	49.2	50.4	49.3	886	1010	586	700	0.984	1.074	0.646	0.747
C-478	6042	71.3	80.0	71.4	80.2	493	195	234	92	1.426	1.327	0.685	0.632
	3038	70.5	77.1	68.2	77.3	533	161	449	148	1.459	0.768	1.063	0.720
	1485	65.5	75.7	65.7	75.9	392	215	366	217	0.793	0.897	0.746	0.921
	164	64.4	74.6	74.4	74.7	784	141	101	66	1.493	0.529	0.373	0.251
C-479	4324	56.2	58.5	56.1	58.8	1050	527	684	357	1.404	0.768	0.910	0.527
	2457	57.2	56.8	56.9	57.1	1170	758	657	439	1.622	1.035	0.901	0.608
	906	58.3	56.1	57.9	56.2	939	948	592	360	1.358	1.260	0.845	0.481
	316	59.6	55.9	59.3	55.9	881	454	569	231	1.346	0.599	0.857	0.305

*Partial or no pitch and roll information available

Section 3.1. The corresponding sun zenith angles for each filter and altitude are also presented in columns 3 through 6. Columns 11 through 14 contain the ratio of the downwelling irradiance divided by the clear day irradiance for the photopic derived from Brown (1952). This takes out the effect of sun zenith angle. The ratio generally decreases as mean wavelength of filter increases and decreases with cloud cover.

The lowest altitude downwelling irradiance values for pseudo-photopic Filter 4 were available for eleven of the OPAQUE V flights. These are graphed in Fig 8-13.

The symbols indicate the cloud categories used in Table 7.2. Since the altitudes for the lowest straight and level sequences for Filter 4 ranged between 90 and 330 meters above ground level, they can be compared to the ground-level values of Brown (1952). The illuminance values of Brown for unobscured sun, partial cloud, and storm cloud conditions have been converted to irradiance units and depicted as solid curves in Fig. 8-13.

Most of the irradiances cluster about the average-cloud irradiances of Brown. Two scattered-cloud irradiances are slightly above the clear day curve. In general the measured downwelling irradiances compared well to the Brown curves.

The average pitch of the aircraft during the vertical profile sequences was 6.5 degrees during ascent and −2.7 degrees during descent so that the dual irradiometer was roughly +4.0 degrees from horizontal during ascent and −5.2 degrees from horizontal during descent. The aircraft heading was

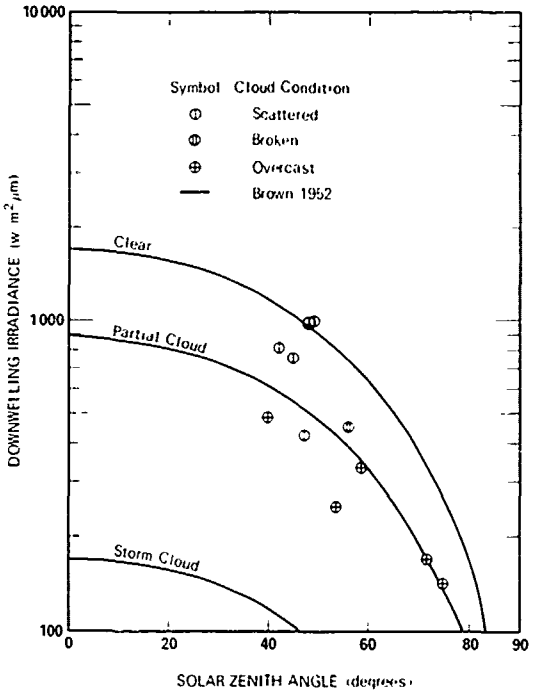

Fig 8-13 Low Altitude Downwelling Irradiances for OPAQUE V Filter 4 Pseudo Photopic Compared to Brown (1952)

generally cross sun to minimize this effect. Generally, however, the orientation of the dual irradiometer during the vertical profile could not be kept within as close an angular tolerance as during the straight and level flight elements. Therefore, it is preferable to use the values from the straight and level sequences in Table 8.5 for the absolute values of downwelling irradiance and to use the vertical profile graphs in Section 7.3 to indicate the variability of downwelling irradiance with space and time during the flight.

The downwelling irradiances for Filters 3 and 5 have been deleted in the graphs in Section 7.3 below 4 kilometers for 9 flights: C-460, C-461, C-462, C-463, C-466, C-468, C-469, C-472 and C-474 These measurements had been affected by the intermittent problem in purging the irradiometer discussed in Section 3.1.

The vertical profiles generally maintained the orientation of the irradiometer toward the sun within ±4 degrees from horizontal Roll and/or pitch information documenting the orientation of the irradiometer was unavailable for parts of four of the flights, due to problems with the vertical reference gyro. Hence the vertical profiles for the following flights have a less certain orientation relative to the sun: C-460 (Filters 2, 4, 5), C-463 (Filter 2), C-475 (Filters 3, 4, 5), and C-476 (Filters 2, 3).

In the graphs of downwelling irradiance versus altitude in Section 7.3, the clear flights have stable irradiances and the mostly clear to scattered flights (cloud category 2) all have portions of the profile with stable irradiances. In addition, there are a few flights in each of the next two cloud categories with portions of profiles with stable irradiances. In general, the more stable irradiance portions of a flight

tended to be the high altitude portions. The only flight wherein the irradiance decreased with mean wavelength of filter, *i.e.*, Filter 2>4>3>5 at all altitudes without crossovers was flight C-460. All other flights had at least some crossovers with the low altitude portions generally showing the most.

Downwelling irradiance for Filter 4 pseudo-photopic has been graphed separately for the OPAQUE V flights in Fig. 8-14 in the same flight track groupings as were Figs. 8-1, 8-2 and 8-7. There are no irradiance data for Filter 4 flight C-475. The average sun zenith angle for each profile is marked on each graph. There is a large enough range of sun zenith angle on most of the six plots in Fig. 8-14 so that the lower irradiances at the larger sun zenith angles are readily apparent. The other broad feature is the generally higher variability under cloud cover due to variation in cloud cover thickness and amount.

Albedo. The albedo is the ratio of the upwelling to downwelling irradiance. The albedos for the OPAQUE V airborne data are summarized in Table 8.6. The albedos for the flights over water are presented first, and then the flights over land.

Note that low altitude albedos are available for the nine flights wherein purging problems had affected the absolute values of irradiance. The problem was condensation on an internal prism which affected the upwelling and downwelling irradiance by the same factor, hence the albedos are unaffected and valid.

The low altitude albedos for the four filters lie in a reasonable range for each type of terrain. The low altitude albedos over water are also in a reasonable range for the low wind speeds. The over-the-water albedos are relatively neutral spectrally as is reasonable since most of the upwelling irradiance is from reflected sky and sunlight and water reflectance is essentially neutral in this region of the spectrum. Most of the over-the-water data were measured in the wind speed range covered by the Beaufort Nos. 2 and 3. Beaufort No. 2 (1.6-3.3 mps) is described as small wavelets, no breaking crests, whereas Beaufort No. 3 (3.4-5.4 mps) has scattered whitecaps. The higher reflectances for C-478 and C-479 with wind speeds up to 9.3 mps are consistent with Beaufort No. 5 (8.0-10.7 mps) with many whitecaps and some spray. The Filter 2 low altitude albedo for C-478 was probably at the lower wind speed.

The Birkhof track is described as being over forest cover with intermittent green fields and valleys. The low altitude albedos for Birkhof are more often typical of the expected low reflectances over forest, therefore for ease of comparison, these data are grouped after the tracks flown over cultivated areas. The low altitude albedos for over land flights for Filters 2, 4, 3 and 5 are reasonable for cultivated fields or forest in the summer. Filter 4 values are expected to be slightly higher than the values for Filters 2 and 3. The Filter 5 values also show the expected high chlorophyll reflectance in the near infrared.

The albedos tend to increase as expected with altitude. In general, the variability, with wavelength and altitude, is indicative of the variability of the terrain and underlying cloud conditions as indicated in Table 7.2.

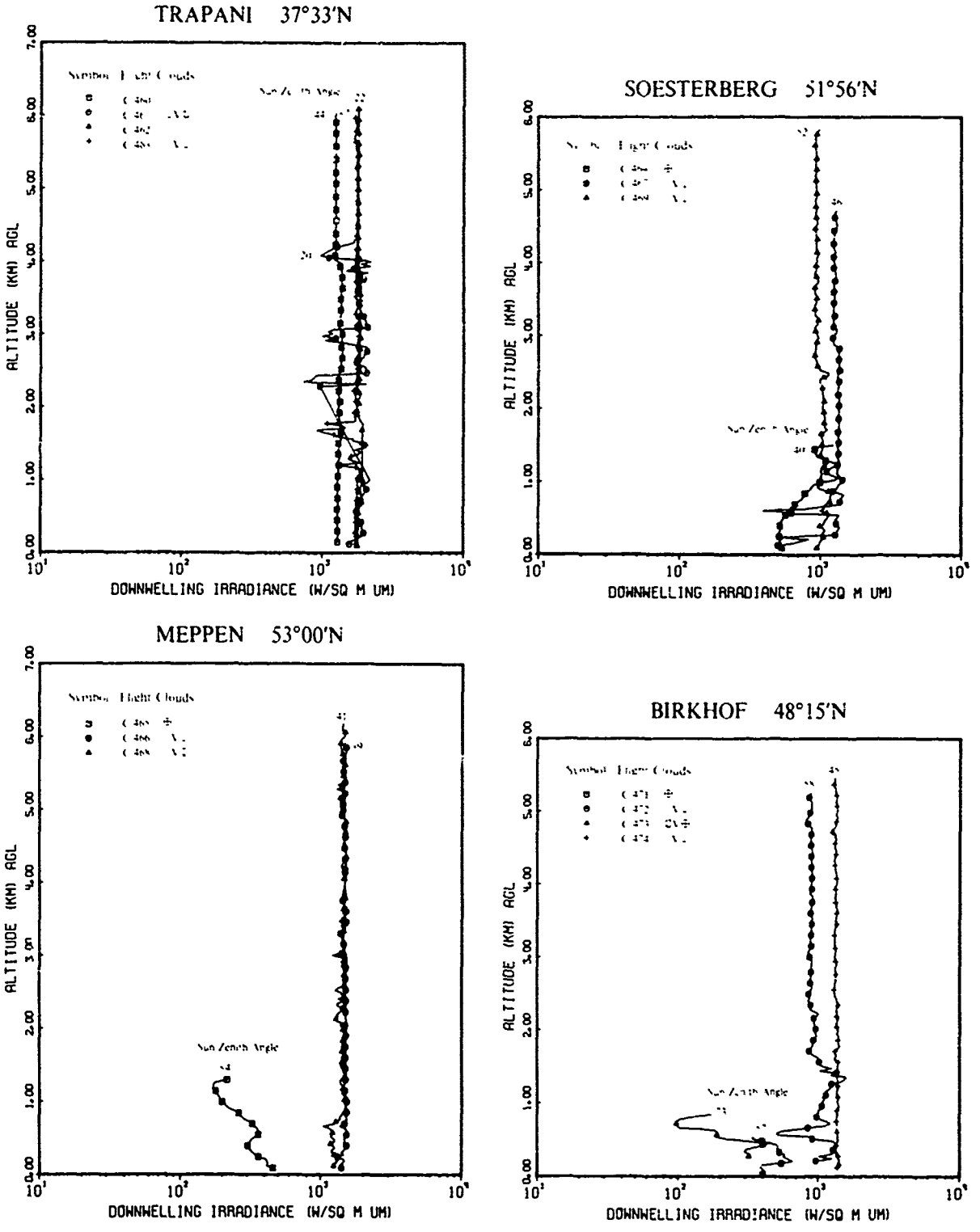

Fig 8-14 Downwelling Irradiance Profiles for the Filter 4 Pseudo-Photopic Response During OPAQUE V Flights from 2 August to 26 September, 1978

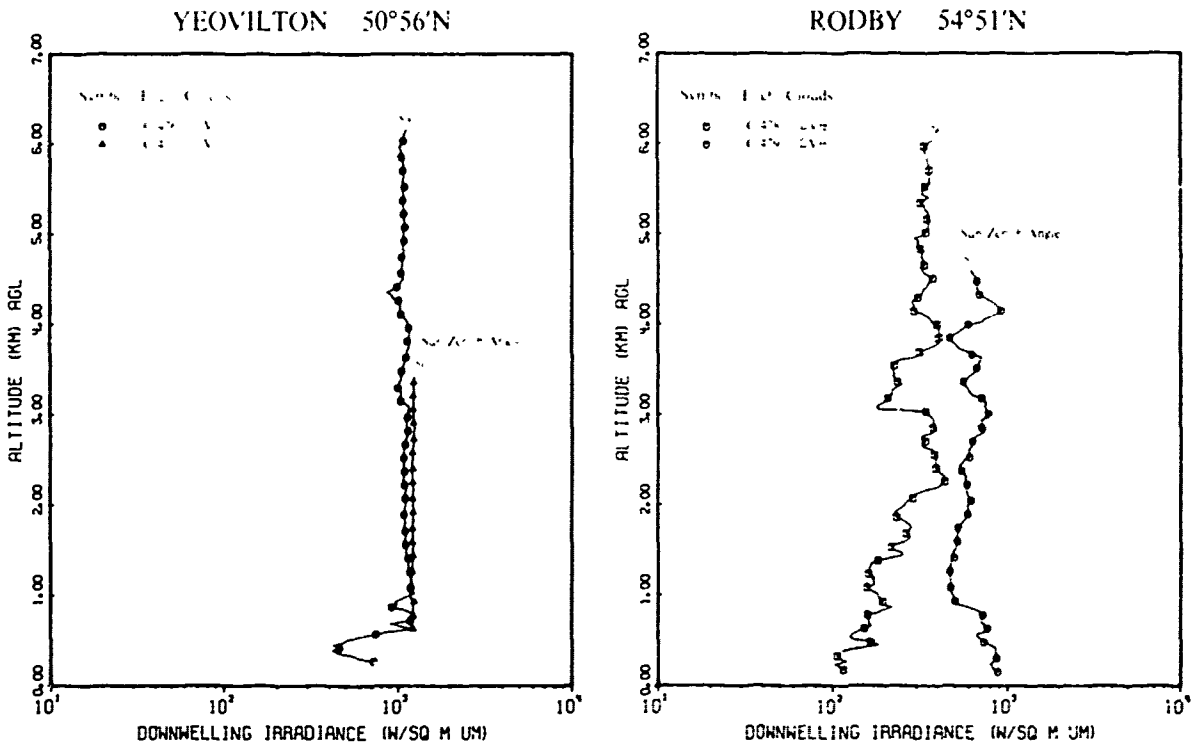

Fig 8-14 (con't) Downwelling Irradiance Profiles for the Filter 4 Pseudo-Photopic Response During OPAQUE V Flights from 2 August to 26 September 1978

Table 8.6. Albedo as Measured by the Dual Irradiometer During Straight and Level Flight Elements OPAQUE V

Track	Terrain Description	Wind Speed (mps)	Flight	Average Altitude (meters)	Albedo			
					Filter 2	Filter 4	Filter 3	Filter 5
Trapani, Sicily	Shallow water nearby coast of brown and green tolling fields	3 to 5	C-460*	6137	0.150	0.171	0.106	0.139
				4037	0.112	0.134		
				1836	-	0.074		
				308	0.069	0.059	0.040	0.049
		1 to 4	C-461	4465	0.122	0.103	0.078	0.110
				2450	0.102	0.079	0.067	0.056
				1505	0.095		0.061	
				290	0.082	0.058	0.053	0.056
		4 to 1	C-462	6150	0.111	0.091	0.067	0.062
				4215	0.101	0.069	0.063	0.051
				1810	0.093	0.056	0.053	0.040
				270	0.056	0.038	0.034	0.027
		0 to 6	C-463*	6095	0.124	0.099	0.068	0.063
				366	0.102	0.085	0.059	0.057
				1830	0.082	0.079	0.058	0.044
				280	0.056	0.057	0.031	0.031

* Partial or no pitch and roll information available

Table 8.6. (Cont.) Albedo as Measured by the Dual Irradiometer During Straight and Level Flight Elements OPAQUE V

Track	Terrain Description	Wind Speed (mps)	Flight	Average Altitude (meters)	Albedo Filter 2	Albedo Filter 4	Albedo Filter 3	Albedo Filter 5
Rodbs Denmark	Relatively shallow water nearby coast of flat cultivated farmlands with occasional woods and small towns	6.2 9.3	C-478	6042	0.223			0.194
				3038	0.170	0.25?	0.0.9	0.196
				1485	0.133	0.236	0.129	0.130
				164	0.053	0.150	0.154	0.123
		8.2 9.3	C-479	4324	0.169	0.138	0.125	0.211
				2457	0.111	0.085	0.113	0.159
				906	0.116	0.089	0.119	0.087
				316	0.090	0.100	0.093	0.113
Soesterberg Netherlands	green fields with occasional brown fields and small towns		C-464	1504	0.169	0.145	0.089	0.392
				270	0.070	0.087	0.060	0.390
			C-467	4717	0.215	0.256	0.215	0.433
				2558	0.191	0.190	0.209	0.425
				890	0.068	0.115	0.087	0.362
				287	0.046	0.090	0.066	0.582
			C-469	5860	0.185	0.255	0.147	0.391
				2510	0.155	0.192	0.142	0.417
				820	0.097	0.150	0.103	0.413
				280	0.074	0.100	0.079	0.327
Meppen Germany	Green and brown fields with occasional dark woods and small towns		C-465	1300	0.129	0.165	0.112	0.192
				256	0.055	0.090	0.074	0.247
			C-466	5545	0.138	0.138	0.115	0.317
				3100	0.122	0.134	0.120	0.315
				1150	0.085	0.115	0.123	0.298
				235	0.062	0.073	0.100	0.285
			C-468	6038	0.189	0.205	0.153	0.306
				3111	0.177	0.172	0.152	0.350
				1386	0.113	0.151	0.148	0.284
				260	0.07?	0.091	0.126	0.375
Yeovilton England	Rolling green fields and woods with occasional brown fields and small towns		C-475*	3093	0.159			
				927	0.062		0.083	
				327	0.045		0.081	
			C-476*	6188	0.306	0.164	0.178	0.448
				3105	0.122	0.215	0.141	0.419
				1017	0.156	0.133	0.204	0.282
				298	0.060	0.092	0.107	0.381
			C-477	3481	0.164	0.129	0.208	0.387
				632	0.053	0.092	0.074	0.438
				318	0.05?	0.088	0.070	0.340
Birkhof Germany	Forest cover with intermittent green fields and valleys		C-471	535	0.038	0.07?	0.072	0.317
				??	0.038	0.069	0.084	0.267
			C-472	5315	0.518	0.368	0.388	0.730
				3700	0.393		0.371	
				1950	0.124	0.608	0.264	0.634
				1.0	0.041	0.099	0.066	0.280
			C-473	855	0.084	0.101	0.037	0.378
				280	0.022	0.066	0.062	0.240
			C-474	5485	0.107	0.138	0.096	0.304
				2875	0.090	0.080	0.083	0.244
				?15	0.048	0.076	0.070	0.314
				270	0.051	0.065	0.05?	0.282

* Partial or no pitch and roll information available

8.3. SUMMARY

Nineteen project data flights have been presented and evaluated with specific attention afforded to profiles of total volume scattering coefficient and downwelling irradiance. Selected meteorological measurements taken concurrently with these profile data have been included as background information and for structural comparisons with the scattering coefficient profiles.

The data for OPAQUE V represent flights made during the summer, and some data missions were flown under poor to marginal weather conditions. These flights are welcome additions to the real world documentation afforded by the OPAQUE series.

The OPAQUE V flights were contiguous in time and space with some ground level measurements of total volume scattering coefficient. All of the appropriate ground data are included herein in the profile graphs and tables as the ground level value. In addition, most of the remaining vertical profiles were flown down to very low altitudes [180 m to 90 m]. Thus the low altitude scattering profile with altitude is well documented.

The addition of this large data sample to our data base greatly improves the breadth and depth of the data catalog now available for further comparative and statistical analysis.

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Lt. Cmdr. Duncan Baker, Met. Officer
Chief Maltby, Flight Planning

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APPENDIX A

GLOSSARY AND NOTATION

The notation used in reports and journal articles produced by the Visibility Laboratory staff follows, in general, the rules set forth in pages 499 and 500, Duntley *et al.* (1957). These rules are.

Each optical property is indicated by a basic (parent) symbol.

A presubscript may be used with the parent symbol as an identifier, *e.g.*, b indicates background while t denotes an object, *i.e.* target.

A postsubscript may be used to indicate the length of a path of sight, *e.g.*, r denotes an *apparent* property as measured at the end of a path of sight of length r, while o denotes an *inherent* property based on the hypothetical concept of a photometer located at zero distance from an object, *i.e.* target.

A postsuperscript $^{\cdot}$ or postsubscript $_{\cdot}$, is employed as a mnemonic symbol signifying that the radiometric quantity has been generated by the scattering of ambient light reaching the path from all directions.

The parenthetical attachments to the parent symbol denote altitude and direction. The letter z indicates altitude in general; z_t is used to specify the altitude of a target. The direction of a path of sight is specified by the zenith angle θ and the azimuth ϕ. In the case of irradiances, the downwelling irradiance is designated by d, the upwelling by u.

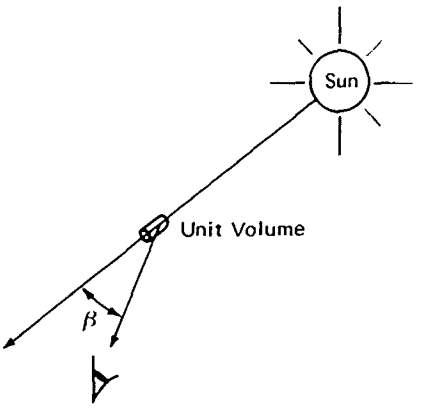
The radiometric symbols used herein now correspond to the OSA recommendations in Section 1 of Driscoll and Vaughn (1978). *Prior to June 1980, the symbol used for radiance L was N, for irradiance E was H, and for attenuation length Ω was L.*

The glossary for meteorological symbols is presented in Section 6.

Symbol	Units	
A(z)	none	Albedo at altitude z, defined by the equation $A(z) \equiv E(z,u)/E(z,d)$.
AGL	none	Above ground level. Normally expressed in meters or kilometers.
E	$W/m^2\mu m$	Irradiance (formerly symbol H) defined as $E \equiv \int E_\lambda \overline{S_\lambda T_\lambda}\, d\lambda/\delta\lambda$
$E(z,d)$	$W/m^2\mu m$	Irradiance produced by downwelling flux as determined on a horizontal flat plate at altitude z [formerly $H(z,d)$]. In this report d is used in place of the minus sign in the notation $[H(z,-)]$ which appears in Duntley (1969). This property may be defined by the equation $E(z,d) \cong \int_{\Sigma\pi} L(z,\theta',\phi')\cos\theta' d\Omega'$

$E(z,u)$	$W/m^2\mu m$	Irradiance produced by the upwelling flux as determined on a horizontal flat plane at altitude z [formerly $H(z,u)$]. Here u is substituted for the plus sign formerly used in the notation [$H(z,+)$]
L	$W/sr m^2\mu m$	Radiance (former symbol N) is defined as $L \equiv \int L_\lambda \overline{S_\lambda T_\lambda}\, d\lambda/\delta\lambda$
$L(z,\theta,\phi)$	$W/sr m^2\mu m$	Radiance as determined from altitude z in the direction specified by zenith angle θ and azimuth ϕ [formerly $N(z,\theta,\phi)$].
$\mathcal{L}(z)$	m	Attenuation length at altitude z. This property is the reciprocal of the attenuation coefficient $\alpha(z)$. $\mathcal{L}(z) \equiv \frac{1}{\alpha(z)}$
$\bar{\mathcal{L}}(z)$	m	Equivalent attenuation length is defined as $\bar{\mathcal{L}}(z) = \frac{-z}{\ln T_z(0,0)}$.
${}_wP(t)$	mb	Saturated vapor pressure at ambient temperature.
${}_wP({}_dt)$	mb	Vapor pressure at ambient temperature which is equal to the saturated vapor pressure at dewpoint or frostpoint temperature.
$Q(z)$	none	Optical scattering mixing ratio at altitude z. This quantity is defined as the ratio of the total volume scattering coefficient at altitude z, to the molecular (or Rayleigh) volume scattering coefficient at the same altitude z. $Q(z) \equiv s(z)/{}_Rs(z)$
$\mathcal{Q}(z)$	none	Volume scattering function ratio at altitude z. This quantity is defined as the ratio of the total volume scattering function at altitude z and scattering angle β, to the molecular (or Rayleigh) volume scattering function at the same altitude and scattering angle. $\mathcal{Q}(z) \equiv \sigma(z,\beta)/{}_R\sigma(z,\beta)$
RH	percent	Relative humidity $RH = [{}_wP({}_dt)/{}_wP(t)]100$.
$\overline{S_\lambda T_\lambda}$	none	Standardized relative spectral response of filter/cathode combination where S_λ is spectral sensitivity of the multiplier phototube cathode and T_λ is spectral transmittance of optical filter.

$s(z)$	m^{-1}	Total volume scattering coefficient as determined at altitude z. This property may be defined by the equations $s(z) \equiv \int_{4\pi} \sigma(z,\beta)\, d\Omega \equiv {}_M s(z) + {}_R s(z)$ In the absence of atmospheric absorption, the total volume scattering coefficent is numerically equal to the attenuation coefficient.
${}_R s(z)$	m^{-1}	Volume scattering coefficient for Rayleigh *i.e.* molecular scattering at altitude z.
${}_M s(z)$	m^{-1}	Volume scattering coefficient for Mie *i.e.* aerosol, scattering at altitude z.
$t(z)$	°C	Ambient temperature at altitude z.
${}_d t$	°C	Dewpoint or frostpoint temperature.
$T(z)$	°K	Absolute temperature at altitude z.
$T_r(z,\theta)$	none	Radiance transmittance as determined at altitude z for a path of sight of length r at zenith angle θ [formerly referred to as "beam" transmittance]. This property is independent of azimuth in atmospheres having horizontal uniformity. It is always the same for the designated path of sight or its reciprocal.
VV	km	Visibility as estimated by meteorologists assuming $VV = 3/s(z)$.
z	m	Altitude, usually used as above ground level.
z_t	m	Altitude of any applicable target.
$\alpha(z)$	m^{-1}	Volume attenuation coefficient as determined at altitude z. In the absence of atmospheric absorption, the attenuation coefficient is numerically equal to the volume scattering coefficient.
β	deg	Symbol for scattering angle of flux from a light source. It is equal to the angle between the line from the source to any unit scattering volume and the path of a ray scattered off this direct line. See illustration.

β (con't.)		
Δ	none	Symbol to indicate incremental quantity and used with r and z to indicate small, discrete increments in path length r and altitude z.
δ_λ	nm	Effective passband (formerly designated "response area") for a filtered sensor is defined as $\delta_\lambda \equiv \sum(\overline{S_\lambda T_\lambda})\Delta\lambda$.
θ	deg	Symbol for zenith angle. This symbol is usually used as one of two coordinates to specify the direction of a path of sight.
θ'	deg	Symbol for zenith angle usually used as one of two coordinates to specify the direction of a discrete portion of the sky.
λ	nm	Symbol for wavelength.
$\bar{\lambda}$	nm	Mean wavelength is defined as $\bar{\lambda} \equiv \sum \lambda(\overline{S_\lambda T_\lambda})\Delta\lambda/\delta_\lambda$
$\rho(z)$	kg/m^3	Density at altitude z.
σ	$m^{-1}sr^{-1}$	Symbol for volume scattering function. Parenthetical symbols may be added; for example, β may be used to designate the scattering angle from a source. In Gordon (1969) the parenthetical symbols are z and β for altitude and scattering angle.
$\sigma(z,\beta)/s(z)$	sr^{-1}	Proportional directional volume scattering function. This may be defined by the equation $\int_{4\pi}[\sigma(z,\beta)/s(z)]d\Omega \equiv 1.$
ϕ	deg	Symbol for azimuth. The azimuth is the angle in the horizontal

		plane of the observer between a fixed point and the path of sight. The fixed point may be, for example, true north, the bearing of the sun, or the bearing of the moon. This symbol is usually used as one of two coordinates to specify the direction of a path of sight.
ϕ'	deg	This symbol for azimuth is usually used as one of two coordinates to specify the direction of a discrete portion of the sky.
Ω	sr	Symbol for solid angle. For a hemisphere: $\Omega = 2\pi$ steradians; For a sphere: $\Omega = 4\pi$ steradians.