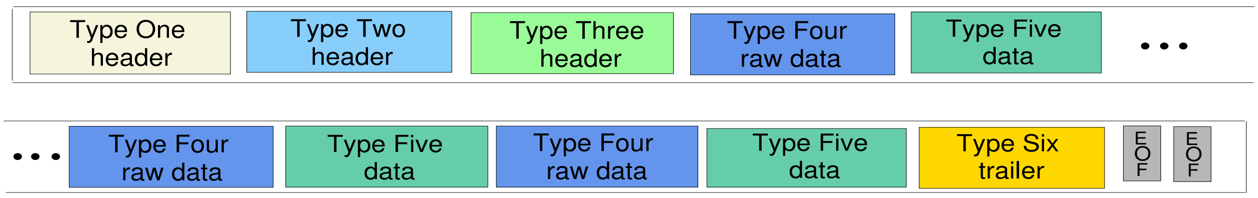
8/1/00

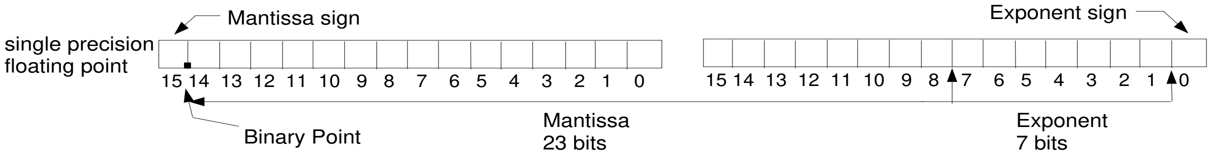
AOC Standard Tape Format

The Aircraft Operations Center Standard Tapes consist of six types of files: Type One(34 bytes in size), Type Two(808 real bytes in size), Type Three(384 bytes in size), Type Four(4440 bytes in size with 10 records of 222 words each), Type Five(2120 bytes in size with 10 records of 106 words each)and Type Six(30 bytes in size). Types One, Two, and Three are header files and appear once at the start of the tape. Type Six is a trailer file and appears once at the end of the tape. The Type Six record is followed by 2 end of file delimiters. Type Four and Five are the data files, original and converted respectively, and alternating they fill out the tape in ten second blocks. All of the files are in integer format except the Type Two file which is in HP 32-bit floating point format(see below). The data are recorded once per second (1 HZ), but are buffered and recorded in ten second block records. Each ten second block is recorded alternatively original(Type Four) and converted (Type Five) data.



AOC Standard Tape Record Structure

HP 32-bit floating point format



The following listings give the positions of each parameter that is recorded for type of file. The Type Two file is used to change the original data on the Type Four file into usable units. The Type Three file is used to convert the Type Five file data into actual values.

AOC STANDARD TAPE RECORD TYPES

TYPE 1 - HEADER RECORD. CONTAINS INFORMATION REGARDING FLIGHT IDENTIFICATION. RECORD SIZE IS 34 BYTES.

TYPE 2 - ORIGINAL DATA TRANSFORMATION RECORD. CONTAINS COEFFICIENTS REQUIRED TO CONVERT ORIGINAL TAPE PARAMETERS TO SCIENTIFIC UNITS...RAW DATA ON RECORD 4 TO PROCESSED DATA ON RECORD 5. RECORD SIZE IS 808 BYTES.

TYPE 3 - CONVERTED DATA TRANSFORMATION RECORD. ESSENTIALLY A METHOD FOR PLACING THE DECIMAL POINT IN RECORD 5. RECORD SIZE IS 384 BYTES.

TYPE 4 - ORIGINAL DATA RECORD. RECORD SIZE IS 4440 BYTES, 10 SECONDS OF 222 WORDS EACH.

TYPE 5 - CONVERTED DATA RECORD. RECORD SIZE IS 2120 BYTES, 10 SECONDS OF 106 WORDS EACH.

TYPE 6 - TRAILER RECORD. RECORD SIZE IS 30 BYTES. THIS RECORD IS FOLLOWED BY 2 END-OF FILE DELIMITERS.

TYPE 1 - HEADER RECORD

WORD PARAMETER

1. TYPE OF RECORD (1)
2. NUMBER OF WORDS IN RECORD (17)
3. AIRCRAFT NUMBER (42 OR 43)
4. YEAR OF FLIGHT
5. MONTH
6. DAY
7. HOUR BEGINNING OF FLIGHT
8. MINUTE
9. SECOND
10. HOUR END OF FLIGHT
11. MINUTE
12. SECOND
13. DATE PROCESSED MO DY Y (XXXXX)
14. DATE OF PROGRAM MO DY Y (XXXXX)
15. NOT USED
16. NOT USED
17. NUMBER OF TAPE

TYPE 1 FILE - EXAMPLE

1	17	42	98	9	25	10	26	1	18	58	0	12218	6094	0	0	15

TYPE 2 - ORIGINAL DATA TRANSFORMATION RECORD

The word address refers to the location in the TYPE 4 record of the parameter. The four values following the word address are the static constants for that parameter as determined by AOC's calibration laboratory. Since the information on Record 4 of the standard tape is in engineering units (counts) a conversion coefficient must be applied to convert the counts to a voltage. Excluding the intercept (A0), the conversion coefficient is multiplied to the remaining static constants in the following manner:

WORD	**PARAMETER**
1.	TYPE (2)
2.	NUMBER OF WORDS IN RECORD (404)

IF THE WORD ADDRESS IS POSITIVE THEN THE FOLLOWING FORMAT HOLDS TRUE

3.	WORD ADDRESS IN TYPE 4 RECORD
4.	CUBIC COEFFICIENT A3
5.	SQUARE COEFFICIENT A2
6.	SLOPE A1
7.	INTERCEPT A0
8.	WORD ADDRESS IN TYPE 4 RECORD
	.
	.

A1 = A1(static cal lab constant) * conversion coef.

A2 = A2(static cal lab constant) * (conversion coef. **2)

A3 = A3(static cal lab constant) * (conversion coef. **3)

PARM(raw) = A3*(counts) + A2*(counts) + A1*(counts) + A0

****

If the word address is a negative number, the third and fourth numbers are coefficients used to compute the dynamic calibration constant for the parameter. The fifth number is the offset that was calculated from the most recent calibration flight.

IF THE WORD ADDRESS IS NEGATIVE THEN THE FOLLOWING FORMAT HOLDS TRUE

WORD	**PARAMETER**
3.	WORD ADDRESS IN TYPE 4 RECORD
4.	BLANK (ALL ZEROS)
5.	SLOPE
6.	INTERCEPT
7.	OFFSET FROM TOWER FLY BY
8.	WORD ADDRESS IN TYPE 4 RECORD
	.
	.

The following lines of code describe the computation of the dynamic calibration constants for the parameters:

NOTE!!	PSW	-	Rosemount static pressure from wing tip
	PQW	-	Rosemount dynamic pressure from wing tip
	PSF	-	Rosemount static pressure from fuselage
	PQF1	-	Rosemount dynamic pressure from fuselage (1281)
	PQF2	-	Rosemount dynamic pressure from fuselage (1221)
	TT1	-	Total temperature 1 from fuselage
	TT2	-	Total temperature 2 from fuselage
	DW1	-	Dewpoint temperature 1
	DW2	-	Dewpoint temperature 2
	DAP	-	Measured dynamic attack pressure
	DBP	-	Measured dynamic slip pressure
	AP(1)	-	Measured attack pressure from fuselage
	BP(1)	-	Measured slip pressure from fuselage
	AA	-	Attack angle
	SA	-	Slip angle

IMPORTANT NOTICE!!! Beginning with Hurricane Season 1993 the measured static and dynamic pressures will be dynamically corrected using the following equations,

```
 PQERR= .17701*pqm - .0129067*pqm**2 + .00190547*pqm**2.5
     - 7.8284e-05*pqm**3, where pqm is measured dyn. pressure
PQCOR = -PQERR

ALTERR= -.35 + .50/(1.+(psm/410.)**(-25))
      - (.15/(1.+(psm/640.)**(-12)),  where psm is
ALTCOR = -ALTERR                      measured static pressure

PS = PSM + PQCOR + ALTCOR, corrected static pressure
PQ = PQM - PQCOR - ALTCOR, corrected dynamic pressure
```

These aforementioned equations are the results from a trailing cone flight.

Word	Equation
-145	DW1(calc) = DW1(measured) + Offset
-166	DW2(calc) = DW2(measured) + Offset
-146	AA(calc) = Intercept + Slope*(AP(1)/DAP)
-148	SA(calc) = Intercept + Slope*(BP(1)/DBP)

TYPE FILE 2 - EXAMPLE

2.	404.			
1.0000E+02	0.0000E+00	0.0000E+00	1.0000E+00	-1.100E+01
9.7000E+01	0.0000E+00	0.0000E+00	1.0000E+00	0.0000E+00
1.4200E+02	0.0000E+00	0.0000E+00	3.6621E-04	0.0000E+00
1.4300E+02	0.0000E+00	0.0000E+00	3.7396E-03	-7.311E-01
1.4400E+02	0.0000E+00	0.0000E+00	2.1909E-03	-6.536E-01
1.4500E+02	0.0000E+00	0.0000E+00	3.3159E-03	-1.755E+01
1.6600E+02	0.0000E+00	0.0000E+00	3.0674E-03	-7.090E-02
1.5200E+02	8.9244E-13	-4.808E-08	2.9788E-03	4.0947E+00
2.0500E+02	8.3276E-13	-4.520E-08	2.9456E-03	4.2246E+0
1.5400E+02	5.2296E-13	-1.526E-08	2.1861E-03	1.0148E+01
1.5600E+02	0.0000E+00	0.0000E+00	1.4963E-03	0.0000E+00
1.5700E+02	0.0000E+00	0.0000E+00	1.4963E-03	0.0000E+00
1.4600E+02	0.0000E+00	0.0000E+00	2.1011E-03	8.2000E-03
1.4700E+02	0.0000E+00	0.0000E+00	5.2708E-03	-5.915E-01
1.4800E+02	0.0000E+00	0.0000E+00	2.1013E-03	-2.750E-02
1.4900E+02	0.0000E+00	0.0000E+00	5.2379E-03	2.1010E-01
1.5000E+02	0.0000E+00	0.0000E+00	2.4403E-02	2.5151E+02
1.5100E+02	0.0000E+00	0.0000E+00	5.0352E-03	-2.083E-01
1.7400E+02	0.0000E+00	0.0000E+00	2.4408E-02	2.5003E+02
1.7500E+02	0.0000E+00	0.0000E+00	5.0400E-03	5.7000E-03
1.7600E+02	0.0000E+00	0.0000E+00	1.0546E-02	-1.823E+00
1.5800E+02	0.0000E+00	0.0000E+00	2.1073E-03	-7.272E-01
1.5900E+02	0.0000E+00	0.0000E+00	2.1018E-03	-9.610E-02
1.6000E+02	0.0000E+00	0.0000E+00	5.2702E-03	3.2220E-01
1.6200E+02	0.0000E+00	0.0000E+00	1.5224E-03	-9.940E-02
1.6300E+02	0.0000E+00	0.0000E+00	3.7277E-03	1.6070E-01
1.6400E+02	0.0000E+00	0.0000E+00	5.1879E-03	-2.066E-01
1.9000E+02	0.0000E+00	0.0000E+00	3.0518E-03	0.0000E+00
1.9100E+02	0.0000E+00	0.0000E+00	3.0518E-03	0.0000E+00
1.9200E+02	0.0000E+00	0.0000E+00	3.0518E-03	0.0000E+00
-1.500E+02	0.0000E+00	-2.280E-01	2.9350E-02	0.0000E+00
-1.510E+02	0.0000E+00	9.8043E-01	0.0000E+00	0.0000E+00
-1.740E+02	0.0000E+00	-2.527E-01	-1.026E-02	0.0000E+00
-1.750E+02	0.0000E+00	1.0294E+00	0.0000E+00	0.0000E+00
-1.760E+02	0.0000E+00	1.0302E+00	0.0000E+00	0.0000E+00
-1.450E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.660E+02	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.460E+02	0.0000E+00	6.2500E+00	1.0260E+00	0.0000E+00
-1.480E+02	0.0000E+00	7.5414E+00	3.5000E-01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

TYPE 3 - CONVERTED DATA

WORD	**PARAMETER**
1.	TYPE (3)
2.	NUMBER OF WORDS IN RECORD (192)
3.	WORD ADDRESS IN TYPE 5 RECORD
4.	DIVISOR
5.	WORD ADDRESS
6.	DIVISOR
	.
	.

CONVERTED DATA VALUE = TYPE 5 DATA / DIVISOR

TYPE FILE 3 - EXAMPLE Numbers in red represent the type 5 record word address.

3													
192													
12	1	13	10	14	1	15	10	16	1	17	10	18	10
19	10	20	10	21	10	22	10	23	10	24	10	25	10
26	10	27	10	28	10	29	10	30	10	31	10	32	10
33	10	34	10	35	1	36	10	37	10	38	10	39	10
40	1	41	1	42	10	43	1	44	10	45	1	46	10
47	10	48	10000	49	10000	50	10	51	10	52	10	53	10
54	10	55	10	56	10	57	10	58	10	59	10	60	10
61	100	62	100	63	10	64	10	65	10	66	10	67	10
68	10	69	1000	70	1000	71	1	72	100	73	100	74	100
75	1	76	1	77	0	78	0	79	0	80	10	81	10
82	10	83	0	84	0	85	0	86	0	87	0	88	0
89	0	90	0	91	0	92	0	93	0	94	0	95	0
96	0	97	0	98	0	99	0	100	0	101	0	102	0
103	0	104	0	105	0	106	0						

TYPE 4 - ORIGINAL DATA RECORD

The type 4 record contains raw data from the AOC slow tape. The data are recorded as 16 bit HP words. Most of the data is recorded as integer counts and must be converted to volts and then to meaningful units by using the type 2 record. All of the navigation data is stored in a special format, and can only be read by performing special bit shifting operations. If examination of the raw navigation data is desired, ask AOC for a copy of the bit shifting subroutine called PACK.

Array Location	**Description**
1	Type of record (4)
2	Number of words in record (222)
3	MS byte: Slow tape ID LS byte: Aircraft #
4	Size of slow tape logical record = 220
5-10	Micro 29 time - yr,mo,da,hr,mn,sc
11-13	Time based generator 1 - hr,mn,sc; binary (not BCD)
14-16	Time based generator 2 - same as TBG 1
17-19	GPS time of fix - hr, min,sec; same as TBG's
20-21	GPS altitude - MS bit = -102400*32 ft
22-23	GPS latitude - MS bit = -PI*4 radians
24-25	GPS longitude - MS bit = -PI*4 radians
26-27	GPS north vel. - MS bit = -1638.4*2 knots
28-29	GPS east vel. - MS bit = -1638.4*2 knots
30-31	GPS vert. vel. - MS bit = -2048*2 ft/s
32-39	GPS spare
40	GPS north accel. - MS bit = -128 m/s**2
41	GPS east accel. - MS bit = -128 m/s**2
42	GPS vert. accel. - MS bit = -128 m/s**2
43	GPS Chan 1 status 1 (see rcvr 3M specs for bit assignments
44	GPS Chan 1 status 2 (same as status 1)
45-52	GPS Chan 2-5 status (same as chan 1 status 1&2)
53	GPS Figure of Merit word - see rcvr 3M spec. Note: Time FOM from word 64 is in reserved bits (12,11,5,4 in HP notation; 3,4,10,11 in 3M)
54	GPS expected horiz error - LS bit = 1 meter
55	GPS expected vert error - LS bit = 1 meter
56	GPS spare
57-58	INE 1 Altitude - MS bit = -102400*32 ft
59-60	INE 1 Latitude - MS bit = -PI*4 radians
61-62	INE 1 Longitude - MS bit =-PI*4 radians
63-64	INE 1 North Vel. - MS bit = -1638.4*2 knots
65-66	INE 1 East Vel. - MS bit = -1638.4*2 knots
67-68	INE 1 Vert speed - MS bit = -2048*2 ft/s

69-70	INE 1 Drift Angle - MS bit = -PI*4 radians
71-72	INE 1 Heading - MS bit = -PI*4 radians
73-74	INE 1 Pitch Angle - MS bit = -PI*4 radians
75-76	INE 1 Roll Angle - MS bit = -PI*4 radians
77-96	INE 2 Data - Same as INE 1
97	APN 232 RA data in meters; 1 sec avg
98	Spare; 1 sec avg
99	Spare; 1 sec avg
100	RA - APN159 Synchro data in meters; 1 sec avg
101	RA - APN159 digital encoder in meters
102	# of INE bursts av'd this sec; MS byte:INE 1 LS byte:INE 2
103	GPS and APN232 RA burst count; ms nybble - GPS lat/lon/alt burst count, 2ND nyble - GPS velocity east/north/vert burst count, LS byte - APN232 RA number of words averaged this second.
104	# of ISEC word 98 and 99 samples avg this second; ms byte- ISEC(98), ls byte- ISEC(99)
105	Dig_Err: Error flags for Dig. Avg; bit 0 for APN232, etc.
106	Spare
107	ADC unit status - from ADC slow data burst
108	IAU unit status - from IAU burst
109	Operator selections: MS nybble - temp probe nybble 2 - nav. unit nybble 3 - alt. source ls nybl - dewpoint unit
110	Status from Wing Wiring Junction Box
111	Status from Cloud Physics Station
112	Status from Flight Director Station
113	Spare
114	Event switch data - Nav, Sta1, Sta2, Sta3
115	Event switch data - Nrack, Sta5, C3X, Sta7
116	Event switch data - F/D, Pilot
117	
118	
119	Formvar count (optional)
120	Formvar speed (optional)
121-129	Loran information (optional)
130-140	Spare
141	M99 10 msec tic when time was read - use for clock drift tracking.
142	J-W Liquid water
143	RMST TOTAL TEMP #1
144	RMST TOTAL TEMP #2
145	Dew Point 1 (DW1) GENERAL EASTERN

146	AP Alpha (attack) Pressure
147	DAP Differential Alpha Pressure
148	BP Beta (slip) Pressure
149	DBP Differential Beta (slip) pressure
150	PSW Rosemount static pressure from wingtip(#1281)
151	PQW Rosemount dynamic pressure from win#tip(#1281)
152	RD Radiometer Down measures SST (PRT-5)
153	
154	RS Side (CO2) radiometer temperature
155	
156	Vertical Acceleration 2
157	Vertical Acceleration 1
158	RADOME ATTACK PRESSURE
159	RADOME SIDESLIP PRESSURE
160	RADOME DIFF. PRESSURE (RPQ)
161	RADOME IMPACT PRESSURE
162	Spare
163	Spare
164	Spare
165	Spare
166	A.O.C. DEWPOINT #2 (DW2)
167	A.O.C. DEWPOINT #2 BALANCE
168	AIR Lyman Hygrometer
169	Dewpoint #3 EG&G
170-172	Spare
173	King Liquid water
174	PSF - COPILOT ROSEMOUNT #1281 (FUSELAGE)
175	PQF1 - COPILOT ROSEMOUNT #1281 (FUSELAGE)
176	PQF2 - COPILOT ROSEMOUNT #1221F(FUSELAGE)
177-188	Spare
189	ODW Cabin Pressure (RSMT 1201F)
190	AXBT CHANNEL #1
191	AXBT CHANNEL #2
192	AXBT CHANNEL #3
193	UP Pyranometer 1 (Yellow)
194	UP Pyranometer 2 (Red)
195	UP Pyranometer 3 (Clear)
196	UP Pyrgeometer
197	UP Pyrgeometer Case Temp
198	UP Pyrgeometer Dome Temp
199	DOWN Pyranometer 1 (Yellow)
200	DOWN Pyranometer 2 (Red)
201	DOWN Pyranometer 3 (Clear)
202	DOWN Pyrgeometer

203 DOWN Pyrgeometer Case Temp
204 DOWN Pyrgeometer Dome Temp
205 UP PRT-5 RADIOMETER
206 SFMR F1 - 4.630 GHz (optional)
207 SFMR F2 - 5.915 GHz (optional)
208 SFMR F3 - 6.771 GHz (optional)
209 SFMR F4 - 7.200 GHz (optional)
210 SFMR F5 - 6.344 GHz (optional)
211 SFMR F6 - 5.056 GHz (optional)
212 SFMR TempA - base (optional)
213 SFMR TempB - ref (optional)
214 SFMR TempD - antenna (optional)
215-221 Spare
222 Checksum for this second

TYPE FILE 4 - EXAMPLE

word address								
1	4	222	2091	220	1999	9	14	18
9	44	11	18	44	11	18	44	12
17	18	44	10	137	-5951	1247	-21649	-3663
25	-9227	-1222	13287	2323	-19958	-4	-17292	0
33	0	0	0	0	0	0	0	-21
41	-2	-2	2617	10752	2645	9984	2665	10240
49	2696	10752	10937	9708	-28655	7	6	0
57	133	22800	1247	24104	-3663	-6856	-1235	-21944
65	2331	1112	2	-3232	335	-15248	5030	6280
73	150	-16752	-40	-31072	133	10256	1247	31272
81	-3663	-16840	-1228	5704	2314	-2984	2	-9376
89	341	880	5026	-21880	148	8592	-42	-31840
97	4178	0	0	4209	0	10280	316	0
105	22	0	0	0	4098	0	0	0
113	0	0	0	0	0	0	-1	-1
121	0	0	0	0	0	0	0	0
129	-32768	0	0	0	0	0	0	0
137	0	0	0	0	41	28	3834	6308
145	5451	10731	13321	-9075	14467	14590	15525	4276
153	32	2223	-5	-98	222	168	-4340	6388
161	10775	20981	15	-41	48	11081	-30	-1980
169	24	30	-9	-26	42	14792	13861	13290
177	-20	39	-17	112	116	-10571	-4208	-14
185	21	-7	-18	0	13606	-10252	-12289	-12217
193	10	-8	66	-4	-3	13	-33	567
201	-53	51	-49	20	7	851	2343	2604
209	2019	1156	1884	8039	7868	7665	7712	-4
217	20	3611	-2	-46	-15	30853		

TYPE 5 - CONVERTED DATA RECORDED

WORD	SYM	PARAMETER	WORD	SYM	PARAMETER
1	TP	TYPE(5)	26	HD	HEADING (TRUE)
2	WD	NO. WORDS/RECORD	27	PC	PITCH
3	HR	HOUR	28	RL	ROLL
4	MN	MINUTE	29	AA	ATTACK ANGLE
5	SC	SECOND	30	SA	SLIP ANGLE
6	RC1	RECORD COUNT	31	LW	LIQUID WATER
7	RC2	RECORD COUNT	32	PQ	DYNAMIC PRESSURE
8	SW1	SWITCHES	33	TD	DEWPOINT TEMPERATURE
9	SW2	SWITCHES	34	RU	RADIOMETER UP (IF AVAIL)
10	FL1	ERROR FLAGS	35	SW3	SWITCHES
11	FL2	ERROR FLAGS	36	UTAIL	E/W VELOCITY OF TAIL
12	Xla1	LATITUDE (DEG)	37	VTAIL	N/S VELOCITY OF TAIL
13	Xla2	LATITUDE (MIN)	38	WTAIL	VERT VELOCITY OF TAIL
14	Ylo1	LONGITUDE (DEG)	39		
15	Ylo2	LONGITUDE (MIN)	40	GA	GEOPOTENTIAL ALT. (METER)
16	Ralt	RADAR ALTITUDE (Meter)	41	PALT	PRESSURE ALT. (METER)
17	PS	PRESSURE	42	DV	D VALUE
18	TA	AMBIENT TEMPERATURE	43	HT	HEIGHT STANDARD
19	TW1	DEWPOINT SENSOR	44	SP	SURFACE PRESSURE
20	RD	RADIOMETER DOWN	45	RH	RELATIVE HUMIDITY
21	RS	RADIOMETER SIDE	46	TV	VIRTUAL TEMPERATURE
22	GS	GROUND SPEED	47	WAS	VERTICAL AIRSPEED
23	TS	TRUE AIRSPEED	48	GM	RATIO SPECIFIC HEATS
24	WGS	A/C VERTICAL VELOCITY	49	AMA	MACH NUMBER
25	TK	TRACK	50	DA	DRIFT

WORD	SYM	PARAMETER
51	GSX	E/W GROUND SPEED
52	GSY	N/S GROUND SPEED
53	TX	E/W TRUE AIRSPEED
54	TY	N/S TRUE AIRSPEED
55	WX	E/W WIND SPEED
56	WY	N/S WIND SPEED
57	WZ	VERTICAL WIND SPEED
58	WS	WIND SPEED
59	WD	WIND DIRECTION
60		
61	EE	VAPOR PRESSURE
62	MR	MIXING RATIO
63	PT	POTENTIAL TEMP
64	ET	EQUIVALENT POT.TEMP.
65	WXB	E/W AVERAGE WIND
66	WYB	N/S AVERAGE WIND

WORD	SYM	PARAMETER
67	WSB	AVERAGE WIND SPEED
68	WDB	AVERAGE WIND DIR
69	AV1	VERTICAL ACCELEROMETER #1
70	AV2	VERTICAL ACCELEROMETER #2
71	WAC	SEC. WIND AVERAGED OVER
72	BT1	AXBT1
73	BT2	AXBT2
74	BT3	AXBT3
75	NAV	1 = INE 1 2 = INE 2
76	ITMP	TOTAL TEMP USED: 1 OR 2
77-79	NOT USED	
80	DPJ’s VERTICAL GROUND SPEED	
81	DPJ’s VERTICAL AIR SPEED	
82	DPJ’s VERTICAL WIND	
83 - 106	NOT USED	

PLEASE NOTE:
THE WORDS ARE 16 BITS LONG, THE RECORD LENGTH IS 106 WORDS
THE BLOCK LENGTH IS 10 RECORDS...10 x 106 = 1060 WORDS
WORDS 6 AND 7 ARE RECORD COUNTS TOTAL COUNT=RC1+RC2
WORDS 8,9,35 ARE EVENT SWITCHES, HIGH ORDER BIT OF WORD 8 IS SWITCH 1
WORDS 78 THROUGH 106 ARE BLANK EXCEPT FOR HURRICANE TAPE, WORDS 10 AND 11 ARE ERROR FLAGS
FLAG 1 IS IN HIGH ORDER BIT OF WORD 10. IF THE BIT IS ON,
A 1 INSTEAD OF A 0, THE DATA MAY BE IN ERROR.
THE FOLLOWING IS A LIST ASSOCIATING AN ERROR FLAG TO A PARAMETER:

FLAG		FLAG	
1	TIME	11	TRUE AIRSPEED
2	LATITUDE	12	VERTICAL SPEED
3	LONGITUDE	13	TRACK
4	RADAR ALT	14	HEADING
5	AMBIENT PRESS	15	PITCH
6	AMBIENT TEMP	16	ROLL
7	DEWPOINT TEMP	17	ATTACK ANGLE
8	DOWN RADIOMETER	18	SLIP ANGLE
9	SIDE RADIOMETER	19	LIQUID WATER
10	GROUND SPEED	20	DYNAMIC

TYPE FILE 5 - EXAMPLE

word address								
1	5	106						
3	18	45	1	2041	0	0	0	0
11	0	27	229	-80	-245	4189	6099	43
19	-7	176	39	1362	1357	-9	1184	1102
27	25	-6	29	-14	0	732	-8	0
35	0	0	0	0	0	4182	4081	1014
43	3045	9952	69	2784	-9	13992	4059	82
51	1197	-648	-1284	439	-87	-209	0	226
59	225	0	577	594	3195	3389	-85	-203
67	220	228	238	-239	10	0	0	0
75	2	1	0	0	0	6	-9	3
83	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0

TYPE 6 - TRAILER RECORD

WORD PARAMETER

1. TYPE OF RECORD (6)

2. NUMBER OF WORDS IN RECORD (15)

3. NOT USED

4. TOTAL LENGTH OF FLIGHT IN SECONDS (UP TO 32677 SECONDS)

5. NUMBER OF SECONDS FLIGHT LASTS PAST 32677 SECONDS

6. HOUR TAKE OFF TIME

7. MINUTE " " "

8. SECOND " " "

9. HOUR BEGINNING OF REEL (BLOCK OUT TIME)

10. MINUTE " " "

11. SECOND " " "

12. HOUR END TIME OF REEL (BLOCK IN TIME)

13. MINUTE " " " "

14. SECOND " " " "

15. LAST REEL? (1=YES, 0=NO)

TYPE FILE 6 - EXAMPLE

1	17	42	98	9	25	10	26	1	18	58	0	12218	6094	0	0	15

ERROR ANALYSIS

THE FOLLOWING PARAMETERS ARE CHECKED FOR RANGE VALUES AND FOR OTHER CRITERIA A LISTED. FAILING THESE TESTS A FLAG IS RECORDED IN WORDS 10 AND 11 OF THE STANDARD TAPE. FLAGS 1 THROUGH 16 ARE RECORDED IN WORD 10 WITH FLAG 1 IN THE MOST SIGNIFICANT BIT POSITION AND FLAGS 17 THROUGH 20 IN WORD 11 WITH FLAG 17 IN THE MOST SIGNIFICANT BIT POSITION.

FLAG	PARAMETER	RANGE		DIMENSION
1	TI	0-86399	DELTA(TI) NE 1	SEC
2	LA	+/-90	DELTA(Ylat) GT 0.005	DEG
3	LO	+/-180	DELTA(Ylon) GT 0.005	DEG
4	RA	0-9988		M
5	PS	250-1050		
6	TA	-60 to 50	DELTA(TA) GT 4	DEG C
7	TD	-80 to 50	TD GT TA+.5	DEG C
8	RD	+/-50	Rdown +.5 LT TA	DEG C
9	RS	+/-50	ABS(TA-Rside) GT 5	DEG C
10	GS	0-300	DELTA(GS) GT DELTA(TAS) +4	M/S
11	TAS	0-300		M/S
12	WGS	+/-40	TIME GAP > 11 SEC	M/S
13	TK	0-360	DELTA(TK) GT DELTA(HD)+4	DEG
14	HD	0-360		DEG
15	PC	+/-20		DEG
16	RL	+/-60		DEG
17	AA	+/-20		DEG
18	SA	+/-10		DEG
19	LW	-0.1 - 6.		G/M3
20	PQ	0-150		MB

AOC PROCESSING EQUATIONS USED ABD 02/09/94 UPDATE

THE FOLLOWING CODE IS FOR CORRECTING STATIC PRESSURE AND DYNAMIC PRESSURE

```
      PSXX = PSM(IPS)  ! STORE SELECTED MEASURED STATIC PRESSURE
      PQYY = PQM(IPQ)  ! STORE SELECTED MEASURED DYNAMIC PRESSURE

      if(iac.eq.42) then   ! FOR NOAA42

       if(ipq.eq.0) pqyy = pqyy - 2. !IF WING TIP DYNAMIC PRESSURE
                    ! SELECTED USE VAG. OFFSET FROM OBSERVATIONS

       if(ips.eq.1) psxx = psxx + 2. !IF WINGTIP STATIC PRESSURE
                    ! SELECTED USE AVG. OFFSET FROM OBSERVATIONS

C.....    COMPUTE STATIC PRESSURE DEFECT USING DYNAMIC PRESSURE (PQM)

          PQERR = .15211*PQYY - .0122277*PQYY**2 +
     +          .00185083*PQYY**2.5 - 7.7304E-05*PQYY**3

C.....    CORRECT THE RESIDUAL ERROR USING ALTITUDE
C.....    USE MEASURED STATIC PRESSURE (PSM) FOR ALTITUDE

          ALTERR = -.17 + .17 / (1.+(PSXX/560.)**(-18))


      else          ! FOR NOAA43
       if(ipq.eq.0) pqyy = pqyy - 3.30 !IF WINGTIP DYNAMIC PRESSURE
                    ! SELECTED USE AVG. OFFSET FROM OBSERVATIONS

       if(ips.eq.1) psxx = psxx + 3.70 !IF WINGTIP STATIC PRESSURE
                    ! SELECTED USE AVG. OFFSET FROM OBSERVATIONS
                    ! SELECTED USE AVG. OFFSET FROM OBSERVATIONS

C.....    COMPUTE STATIC PRESSURE DEFECT USING DYNAMIC PRESSURE (PQM)

          PQERR = .17701*PQYY - .0129067*PQYY*PQYY +
     +          .00190547*PQYY**2.5 - 7.8284E-05*PQYY**3

C.....    CORRECT THE RESIDUAL ERROR USING ALTITUDE
C.....    USE MEASURED STATIC PRESSURE (PSM) FOR ALTITUDE
C
          ALTERR = -.35 + .5 / (1.+(PSXX/410.)**(-25)) -
     +           (.15 / (1.+(PSXX/640.)**(-12)))
      end if
```

```
C------------------------------------------------------------
       ALTCOR = -ALTERR
       PQCOR = -PQERR

  1.   PS = PSXX + PQCOR + ALTCOR  ! correct static pressure
  2.   PQ = PQYY - PQCOR - ALTCOR  ! correct dynamic pressure

  3.  EE-VAPOR PRESSURE (MB)
        IF(DW1.GE.0)
          EE=6.1078*EXP((17.6498*DW1)/(243.17+DW1))
          TD=DW1
        IF(DW1.LT.0)
          EE=6.1078*EXP((22.4716*DW1)/(272.722+DW1))
          TD=243.17*(ALOG(EE)-1.8096)/(19.4594-ALOG(EE))

  4.  GM-RATIO OF SPECIFIC HEATS (DIMENSIONLESS)
        E=EE/(PS-EE)
        AMR = .62197 * E
        GM=(1004.64+1846.004*AMR) / (717.6+1384.04*AMR)
        GO=GM-1.

      RGAS - GAS CONSTANT   CP - SPECIFIC HEAT AT CONSTANT PRESSURE
        RGAS = 287.05 * (1. + 1.6078*AMR) / (1.+AMR)
        CP = RGAS * GM / GO

  5.  MA-MACH NUMBER (DIM)
        MA=SQRT((2./GO)*((1+ABS(PQ)/PS)**(GO/GM)-1.))

  6.  AA-ATTACK ANGLE (DEG)
        AA=B+A*AP/DAP          ***

  7.  SA-SLIP ANGLE (DEG)
        SA=B+A*BP/DBP          ***

  8.  PA-PRESSURE ALTITUDE (M)
        PA=44331.*(1.-(PS/1013.25)**0.190263)

  9.  GA-GEOPOTENTIAL ALTITUDE (M)
      G = 9.80616 * (1. - cos(2.*lat) *.0026373)
      DEM = 3.085462e-06 + 2.27e-09*(cos(2.*lat)) - 2.e-12*(cos(4.*lat))
      R = (2. * G) / DEM
      GA = (G * R * ralt) / (9.8 * (R + ralt)),

  10. DV-DVALUE (M)
        DV=GA-PA
```

11. TN-AMBIENT TEMPERATURE (DEG K)

```
TTK = TT + 273.16          ! MEASURED TOTAL TEMPERATURE
TN = TTK * (PS/(PS+PQ)) ** (GO/GM)
DEN = PS / (RGAS*TN) *100.     ! DENSITY OF AIR AT FLT LEVEL
TEE = (1 / (CP*DEN)) * PQ * PQ / SQRT(PS)  TEMP PROBE RECOVERY

TTK = TTK + TEE          ! CORRECTED TOTAL TEMPERATURE
TN = TTK * (PS/(PS+PQ)) ** (GO/GM)   ! CORRECTED AMBIENT
                              ! TEMPERATURE
```

12. TAS-TRUE AIRSPEED (M/SEC)

```
TS= SQRT(2. * CP * (TTK-TN))
```

13. TV-VIRTUAL TMEPERATURE (DEG K)

```
TV= RGAS * TN / 287.05
```

14. TA-AMBIENT TEMPERATURE (DEG C)

```
TA=TN-273.16
```

15. RA - ALTITUDE (M)

```
ALT0=RA                  (OVER WATER)
ALT0=10+1.05414*PA       (OVER LAND)
```

16. WGS-VERTICAL VELOCITY (M/SEC) WITH RESPECT TO GROUND

Integeration of accelerometer data merged with differentation of selected radar altimeter data

17. WAS-VERTICAL VELOCITY (M/SEC) WITH RESPECT TO AIR

18. TX,TY,TZ-TRUE AIRSPEED COMPONENTS (M/SEC)

```
TXA=TS/SQRT(1+TAN(AA)*TAN(AA)+TAN(SA)*TAN(SA)
TYA=-TXA*TAN(SA)       COMPUTE RELATIVE WIND DIRECTION VECTOR
TZA=-TXA*TAN(AA)
                  TRANSFORM FROM AIRCRAFT TO EARTH COORDS.
TXR=TXA
TYR=TYA*COS(RL)-TZA*SIN(RL)    REMOVE ROLL
TZR=TYA*SIN(RL)+TZA*COS(RL)

TXP=TXR*COS(PC)-TZR*SIN(PC)
TYP=TYR                     REMOVE PITCH
TZP=TXR*SIN(PC)+TZR*COS(PC)

TX=TXP*SIN(HD)-TYP*COS(HD)
TY=TXP*COS(HD)+TYP*SIN(HD)     REMOVE HEADING
TZ=TZP
```

19. W- VERTICAL WIND (M/SEC)
W=WGS-WAS

20. WX,WY-HORIZONTAL WIND COMPONENTS (M/SEC)
WX=GSx-TX
WY=GSy-TY

21. WS-WIND SPEED (M/SEC)
WS=SQRT(WX*WX+WY*WY)

22. WD-WIND DIRECTION (DEG)
WD= DEG * ATAN2(WX,WY) - 180. , DEG = 57.29578
IF(WD.LT.0.) WD = WD + 360.

23. GS-GROUND SPEED (M/SEC)
GS=SQRT(GSx*GSx+GSy*GSy)

24. TK-TRACK ANGLE (DEG)
TK= DEG * ATAN2(GSx,GSy) , DEG = 57.29578
IF(TK.LT.0.) TK = TK + 360.

25. DA-DRIFT ANGLE (DEG)
DA=TK-HD
IF(DA.GE.180)DA=DA-360
IF(DA.LE.-180)DA=DA+360

26. HT-HEIGHT OF STANDARD SURFACE (M)
TSA=288.15-0.0065*PA
HT=GA+(H-PA)*TV/TSA
WHERE H=1457m, 3012m, 5574m OR 7185m

27. SP-SURFACE PRESSURE (MB)
PAS=PA-GA*TSA/TV
SP=1013.25*(1.-PAS/44331.)**5.255883

28. EW-SATURATION VAPOR PRESSURE (MB)
EW=6.1078*EXP((17.6498*TA)/(243.17+TA))

29. RH-RELATIVE HUMIDITY (%)
RH=(E*(PS-EW)/EW)*100 , where E = EE / (PS - EE)

30. AMR-MIXING RATIO (G/KG)
AMR= 1000. * AMR

31. PT-POTENTIAL TEMPERATURE (DEG K)

PT=TN*(1000/PS)**(GO/GM)

32. ET-EQUIVALENT POTENTIAL TEMPERATURE (DEG K)

TL= ((TN-55.) * 2840.) / (2840.-(TN-55.)* ALOG(RH/100)) + 55.

ET = PT * EXP((3.376/TL-0.00254)* AMR * (1.+ .81*AMR/1000.))

*** A AND B DETERMINED BY INFLIGHT CALIBRATIONS.