OUTPUT PARAMETERS FROM ICATS

AIRBORNE SCIENCE DC-8 INFORMATION COLLECTION
AND TRANSMISSION SYSTEM (ICATS)

1.0   **1.0 INTRODUCTION**
This Appendix to ICATS Description Document lists all parameters presently available for selection from the ICATS data output file. From this output file, parameters are selected to be distributed on the RS-232 data lines to experimenters, on video displays at each experimenter rack, for post-flight data retrieval and for future data delivery functions. Each data source is identified, and the output data parameters from that source are described. Column 1 lists the parameter identification code (PARM ID) to be used when retrieving that parameter. Column 2 lists the engineering units for that parameter. Column 3 contains general information on the parameter which includes: parameter name, parameter engineering unit range, sign convention and other comments regarding the measurement when applicable.

2.0 DATA FROM TIME CODE GENERATOR

Note 1: All parameters from TCG shown below are available in ICATS data base for use in display and computation and archiving.

PARAMETER ID	UNITS	COMMENTS
year	year	year as measured from GMT Source: IRIG-B May be input manually if IRIG-B invalid
month	month	
day of month	day	
day of year	days	The day number of the present date according to GMT Source: Datum Model 9110-663 TCG Range: 1 to 366
time in hrs	hrs	
time in secs	secs	
time in msec	msec	time: time code values combined in ICATS available to user in real time and post flight. ASCII format. Range: 00:00:00.000 to 23:59:59.999

3.0   DATA FROM HONEYWELL EMBEDDED GPS/INS   MIL-STD-1553

Note 1: All parameters from GPS/INS shown below are available in ICATS database for use in display and computation and archiving.

PARAMETER ID	UNITS	COMMENTS
eo06_egr_lat	deg	e egr-lat
eo06_egr_lon	deg	e egr lon
eo06_egr_alt	ft	e egr alt
eo06_egr_vel_east	ft/sec	e vel east
eo06_egr_vel_north	ft/sec	e vel north
eo06_egr_vel_up	ft/sec	e vel up
eo17_mode_word1	n/a	e mode w/1
eo17_velocity_x	ft/sec	e vel x
eo17_velocity_y	ft/sec	e vel y
eo17_velocity_z	ft/sec	e vel z
eo17_platform_az	deg	e plat az
eo17_roll_angle	deg	e roll
eo17_pitch_angle	deg	e pitch
eo17_pres_true_hdg	deg	e hdg true
eo17_pres_mag_hdg	deg	e hdg mag
eo17_accel_x	ft/sec2	e acc x
eo17_accel_y	ft/sec2	e acc y
eo17_accel_z	ft/sec2	e acc z
eo17_msl_alt	ft	e alt msl
eo17_mode_word2	n/a	
eo17_roll_rate	deg/sec	e roll rate
eo17_pitch_rate	deg/sec	e pitch rate
eo17_yaw_rate	deg/sec	e yaw rate
eo19_lon_accel	ft/sec2	e acc long
eo19_lat_accel	ft/sec2	e acc lat
eo19_normal_accel	ft/sec2	e acc nor
eo19_roll_ang_accel	deg/sec2	e acc r ang
eo19_pitch_ang_accel	deg/sec2	e acc pang
eo19_yaw_ang_accel	deg/sec2	e acc y ang
eo19_blended_lat	deg	e blend lat
eo19_blended_lon	deg	e blend long
eo25_true_air_spd	knots	e true a/s
eo25_pres_mag_gnd_trk	deg	e mag gnd trk
eo25_pres_drft_ang	deg	e drift ang
eo27_pres_pos_lat	deg	e pres lat
eo27_pres_pos_lon	deg	e pres long
eo27_wind_direction	deg	e wind dir
eo27_wind_velocity	knots	e wind vel
eo27_pres_gnd_spd	knots	e gnd spd

eo27_pres_true_gnd_trk	deg	e tru gnd trk
eo27_predicted_gnd_spd	knots	e pred g/s
eo27_position_err_north	nm	e pos-err n
eo27_posi_error_east	nm	e pos-err e

4.0 DATA FROM RADAR ALTIMETER   MIL-STD-1553 DATA

PARAMETER ID	UNITS	COMMENTS
ra_01_mode_word	n/a	
radar alt	ft	Radar Altitude - Aircraft altitude in feet above land or water as measured by radar. Source: Honeywell APN-222 electronic altimeter system Range: 0 to 70,0000 ft
ra_01_rada_alt_rate	ft/sec	ra alt rate

5.0 DATA FROM NAVIGATIONAL MANAGEMENT SYSTEM   ARINC-429

Note 1: Primary source for display and other output uses of NMS data will be from NMS1. NMS2 could be selected during flight should one fail. Also mission manager can request ICATS operator to select NMS1 or NMS2 for data source if required.

Note 2: All parameters shown below are available in ICATS database for use in display and computation and archiving.

PARAMETER ID	UNITS	COMMENTS
dist to go	nm	distance to go - the distance measured along a great circle path with respect to the aircraft's present position and the next selected waypoint. Range: +- 4,096 nm Orientation: + to selected waypoint - from selected waypoint
nms time go	minutes	nms time to go – time to arrive at the next waypt.

x track dist	nm	Cross track distance - the distance left or right from the desired track to the aircraft's present position measured perpendicular to the desired track. Range: +- 128 nm Orientation: + right of desired track - left of desired track
des track	deg	destination track - the great circle path on the earth's surface connecting the departure and destination positions or two waypoints measured with respect to true north. Range: 0 to 360 deg
drift angle	deg	drift angle: - the angle between the desired track and the aircraft's heading Range: +- 39.9 deg Orientation: + desired track right of a/c heading - desired track left of a/c heading
NMS latitude	deg	Latitude - the aircraft's present latitudinal position over the surface of the earth relative to the equator. Range: +- 90 deg Orientation: + north of the equator - south of the equator
NMS long	deg	Longitude - the aircrafts present longitudinal position over the surface of the earth relative to the prime meridian. Range: +- 180 deg. Orientation: + east of the prime meridian - west of the prime meridian
ground speed	knots	ground speed - the aircraft's speed over the ground in knots. Range: 0 to 2,000 kts.
track angle	deg	track angle - the actual path of the aircraft over the surface of the earth measured with respect to true north through 360 degrees Range 0 to 360 deg
true heading	deg	true heading - the angle between true north and the longitudinal axis of the aircraft. Range: 0 to 360 deg.

wind speed	knots	wind speed - the horizontal velocity of the air mass at aircraft's present position Range: 0 to 256 kts.
wind dir	deg	wind direction - the direction the wind is coming from as measured from true north. Range: 0 to 360 deg.
pitch	deg	pitch angle - the angle between the longitudinal reference axis of the aircraft and the horizontal plane of the earth. Source: NMS Range +- 90 deg Orientation: + up - down
roll	deg	roll angle - the angle between the aircraft lateral axis and a horizontal plane measured about the aircraft's longitudinal axis Source: NMS Range: +-180 deg Orientation: + right - left
NS velocity	knots	North-South vector velocity - the north-south vector velocity component of the Aircraft's ground speed. Range: +- 2000 kts Orientation: + north - south
EW velocity	knots	East-West vector velocity - the east-west vector velocity component of the a/c ground speed. Range +- 2000 kts Orientation: + east - west
wind nose	knots	
pres alt	ft	
nms status	n/a	
nms fromto	n/a	
fp hdr	n/a	
msg type	n/a	
dist dest	nm	
time dest	minutes	

waypt lat	deg	Waypoint latitude - the latitude of waypoint 'waypt num' Orientation: + north of the equator - south of the equator
waypt lon	deg	Waypoint longitude - the longitude of the waypoint 'waypt num' Range: +- 180 deg Orientation: + east of prime meridian - west of prime meridian
nms_msg1	n/a	
nms_msg2	n/a	
nms_msg3	n/a	
nms_msg4	n/a	
nms_stn_type	n/a	
nms_msg_csum	counts	
nms_tac_freq	MHz	
nms_vor_freq	MHz	
nms_dme_freq	MHz	
nms_hoz_cmd	deg	
nms_plocal_dev	DDM	
nms_glide_dev	DDM	
nms_nav_staus	n/a	
nms_frto_ms_to_wpt	n/a	
nms_frto_ms_fr_wpt	n/a	
nms_frto_ls_to_wpt	n/a	
nms_frto_ls_fr_wpt	n/a	
nms_fp_hdr_tot_recd	records	
nms_msgt_wrd_in_msg	n/a	
nms_msgt_wpt_type	n/a	
nms_msgt_wpt_num	n/a	
nms_cal_timetogo	mins	
nms trk ang err	deg	
to wyptnum	n/a	
fr wyptnum	n/a	
towypt lat	deg	
towypt lon	deg	
frwypt lat	deg	
frwypt lon	deg	

6.0 DATA FROM AIR DATA COMPUTER   ARINC-429

Note 1: Primary source for display and other output uses of ADC data will be from ADC1.
ADC2 could be selected during flight should one fail. Also mission manager can request ICATS
operator to select ADC1 or ADC2 for data source if required.

Note 2: All parameters shown below are available in ICATS database for use in display and
        computation and archiving.

PARAMETER ID	UNITS	COMMENTS
pressure alt	ft	Pressure altitude - aircraft pressure in feet corresponding to U.S. Standard Atmosphere, Range –1,871 to 57,343 ft.
baro alt	ft	Baro altitude Range –1,871 to 57,343 ft.
stat air tmp	deg C	Static air temperature - ambient air temperature at aircraft's present position. Range: -99 deg. C to 60 deg. C
Mach #	number	Mach Number - the aircraft's speed as a ratio to the speed of sound. Range: 0.1 to 0.99
vertical spd	ft/min	Vertical speed - vertical climb rate of the aircraft measured in feet per minute. Range: +- 20,480 ft/min Orientation: + ascending - decending
adc tat	deg C	adc tat
ind air spd	knots	Indicated airspeed - indicated air speed corrected for air speed indicator instrument error and static presure source. Range: 30 to 510 kts.
true air spd	knots	True air speed - the actual speed of the aircraft through the air computed air speed corrected for density altitude.
adc_dis_270	n/a	message word 270 - message when converted to binary contains status of adc

adc_dis_350	n/a	message word 350 - message when converted to binary contains status of adc
adc_dis_351	n/a	message word 351 - message when converted to binary contains status of adc

7.0 DATA FROM GLOBAL POSITIONING SYSTEM (GPS) ARINC-429

Note 1: Primary source for display and other output uses of GPS data will be from GPS1. GPS2 could be selected during flight should one fail. Also mission manager can request ICATS operator to select GPS1 or GPS2 for data source if required.

Note 2: All parameters shown below are available in ICATS database for use in display and computation and archiving.

PARAMETER ID	UNITS	COMMENTS
GPS utc time	n/a	GPS time relative to GMT Source: GPS Range: 00:00:00:.000 to 23:59:.999
gps utc fine	secs	
GPS latitude	deg	GPS latitude - the aircraft's present latitudinal position over the surface of the earth relative to the equator.
GPS long	deg	GPS longitude - the aircraft's longitudinal position over the surface of the earth relative to the prime meridian Range +- 180 Orientation: + east of prime meridian - west of prime meridian
GPS alt	ft	GPS alt - the aircraft's present altitude. Range: -1000 to 131,072 ft.
gps lat fine	deg	
gps lon fine	deg	
gps vert spd	ft/min	
gps ns vel	knots	
gps ew vel	knots	
gps trk ang	deg	
gps_hfom	nm	

gps_vfom	ft	
gps_status	n/a	
gps time hr	hr	

8.0 DATA FROM ANALOG SOURCES AND COMPUTED FUNCTIONS

PARAMETER ID	UNITS	NAME/COMMENTS
d/f point 2	deg C	Dew frost point - 2 stage ambient dew or frost point in degrees Centigrade. Source: General Eastern 1011A two-stage thermoelectric hyogrometer system Range -75 deg. C to 50 deg. C Source: Computed utilizing dfp2 analog signal and heat/cool 2 analog signal and max cool 2 analog signal Note: The following state flags appear in the Thousands digit of the data field:

<blockquote>

1   max cooling (internal)
2   max heating (internal)
4   max cooling commanded by oper.
5   max cooling (commanded and internal)
6   max cooling (commanded) and max heating internal

</blockquote>

PARAMETER ID	UNITS	NAME/COMMENTS
d/f point 3	deg C	Dew/Frost Point - 3 stage sensor: EG&G Model 300 three-stage, cooled mirror hygrometer system Source: computed utilizing dfp3 analog signal and status 3 analog signal. Note: The following state flags appear in the Thousands digit of the data field.

<blockquote>

0   normal operation
3   invalid data
4   max cooling commanded by operator
8   max heating commanded by operator

</blockquote>

PARAMETER ID	UNITS	NAME/COMMENTS
IR surf temp	deg C	IR Surface temperature - the infrared temperature of the surface of the earth or cloud top beneath the aircraft Source: Barnes Engineering Co. PRT-5 Nadir viewing, infrared radiometer Range: -65 deg. C to 55 deg. C. Note; Analog parameter

sat computed	deg C	Static Air Temperature - ambient air temperature at aircraft's present position as calculated from total air temperature corrected for aircraft speed. Range –99 deg. C to 33 deg. C Source: Calculated from tot air temp and Mach #
Pressure (atm)	mb	Ambient atmospheric pressure at aircraft's present position as calculated from pressure altitude. Source: Calculated from press alt Range: 114 to 1,050 mb
partpres H2O	mb	Partial pressure of water vapor - the pressure of water vapor as a component of the total atmospheric pressure. Source: Calculated parameter from: selectable d/f Point (d/f point 3 is default) Range: 0.0012 to 388 mb
specific hum	g/kg	Specific humidity - ambient specific humidity at aircraft's present position as calculated from partial pressure of water vapor and atmospheric pressure. Source: Calculated from: partpres H2O pressure Range 0 to 20g H2O/kg air
H2O sat vp - wtr	mb	Saturated vapor pressure with respect to water - the pressure exerted by water vapor in equilibrium with water when the air mass is over a plane surface of water at the same temperature and pressure. Source: Calculated from stat air tmp Range: 0.00004 to 125 mb
H2O sat vp-ice	mb	Saturated vapor pressure with respect to ice - the pressure exerted by water vapor in equilibrium with ice when the air mass is over a plane surface of ice at the same temperature and pressue. Source: Calculated from stat air tmp Range: 0.00002 to 200 mb

rel hum-watr	%	Relative humidity with respect to water - ambient relative humidity with respect to water - at aircraft's present position.

rel hum-watr   %   Relative humidity with respect to water -
ambient relative humidity with respect
to water - at aircraft's present position.
Source: Calculated from partpres H2O
                         H2O sat vp
Range: 0 to 100 %

rel hum-ice   %   Relative humidity with respect to ice -
ambient relative humidity with respect to ice
Source: Calculated from: partpres H20
                         H20 sat vp-i
Range: 0 to 100%

Local siderl time   rad   Local sidereal time - the time defined by the
daily rotation of the earth with respect to the equinox.
uses the local meridian as the terrestrial reference.
Source: Calculated from: Year, Day, Time,
                         Longitude
Range: 0 to 2pi radians

ra sun   rad   Sun right ascension - the arc of the
celestial equator measured eastward from the
vernal equinox to the foot of the great circle
passing through the celestial poles and the sun.
Source: Calculated from: year, day, time
Range: 0 to 2 pi radians

dec sun   rad   Sun declination - the angular distance of
the sun from the celestial equator.
Source: Calculated from: year, day, time
Range: +- pi/2rad
Orientation: + north of the celestial equator
                 - south of the celestial equator

sun el-earth   deg   Sun elevation relative to earth; Sun elevation relative
to the horizontal plane of the earth.
Source: Calculated from: lst, ra sun, dec sun,
                         latitude
Range: +- 90 deg
Orientation: + above the horiz. plane of the earth
                 - below the horiz. plane of the earth

sun az-earth	deg	Sun azimuth relative to earth - the sun azimuth relative to true north. Source: Calculated from: lst, ra sun, dec sun, latitude. Range: 0 to 360 deg.
sun el-ac	deg	Sun elevation relative to aircraft - the sun elevation relative to the horizontal plane of the aircraft. Source: Calculated from: lst, ra sun,dec sun, latitude, pitch,roll true heading Range: +- 90 deg Orientation: + above the horiz. plane of the a/c - below the horiz. plane of the a/c
sun az-ac	deg	sun azimuth relative to aircraft - the sun azimuth relative to the nose of the aircraft.. Source: Calculated from: lst, ra sun,dec sun, latitude,pitch,roll, true heading Range: +- 180 deg Orientation: + right from nose of aircraft. - left from nose of aircraft
sun el rf/ac	deg	Sun elevation - corrected for refraction relative to aircraft. The sun elevation-corrected for refraction - relative to the horizontal plane of the aircraft. Source: Calculated from: sun el-ac, pressure, stat air tmp Range: +- 90 deg. Orientation: + above the horiz plane of the a/c - below the horiz plane of the a/c
sun el rf/ea	deg	Sun elevation - corrected for refraction – relative to earth. The sun elevation – corrected for refraction – relative to the horiz plane of the earth. Source: Calculated from: sun el-ea, pressure, stat air tmp Range: +- 90 deg Orientation: + above the horiz plane of earth - below the horiz plane of earth

sun az-left	deg	Sun azimuth - relative to left side of the aircraft. Source: Calculated from: sun az-ac Range: +- 180 deg. Orientation: + right from left of aircraft - left from left of aircraft
sun az-right	deg	Sun azimuth - relative to right side of the aircraft. Source: Calculated from: sun az-ac Range: +- 180 deg. Orientation: + right from right of aircraft - left from left of aircraft
solar zenith	deg	solar zenith - the angular distance of the sun from zenith. Source: Calculated from: sun el-ea Range: 0 to 180 deg.
ra moon	rad	Moon right ascension - the arc of the celestial equator measured eastward from from the vernal equinox to the foot of the great circle passing through the celestial poles and the moon. Source: Calculated from: year, day, time Range: 0 to 2 pi radians
dec moon	rad	Moon declination - the angular distance of the moon from the celestial equator. Source: Calculated from: year, day, time Range: +- pi/2rad Orientation: + north of the celestial equator - south of the celestial equator

moon el-ea	deg	Moon elevation relative to earth - the moon elevation relative to the horizontal plane of the earth
		Source: Calculated from: lst, ra moon, dec moon
		                          Latitude
		Range: +- 90 deg
		Orientation: + above the horiz. plane of the earth
		            - below the horiz. plane of the earth

moon az-ea	deg	moon azimuth relative to earth - the moon azimuth relative to true north. Source: Calculated from: lst, ra moon, dec moon, Latitude Range 0 to 360 deg
moon el-ac	deg	Moon elevation relative to aircraft - the moon elevation relative to the horizontal plane of the a/c Source: Calculated from: lst, ra moon, dec moon, Latitude, pitch, roll, true heading Range: +- 90 deg
moon az-ac	deg	Moon azimuth relative to aircraft - the moon azimuth relative to the nose of the aircraft. Source: Calculated from lst, ra moon, dec moon, Latitude, pitch, roll, true heading

moon el-rf_ea	deg	Moon elevation-corrected for refraction – relative t to earth: -The moon elevation- correted for refraction relative to the horizontal plane of the earth.
		Source: Calculated from: moon el-ea, pressure,
		                  Stat air temp.
		Range: +- 90 deg
		Orientation: + above the horiz. plane of the earth
		           - below the horiz. plane of the earth

moon_el-rf/ac	deg	Moon elevation – corrected for refraction – relative to aircraft – The moon elevation – corrected for refraction – relative to the horiz plane of the a/c.
		Source: Calculated from: moon el-ac, pressure,
		                  Stat air tmp.
		Range: +- 90 deg.
		Orientation: + above the horiz plane of the a/c
		           - below the horiz plane of the a/c

moon az-left	deg	Moon azimuth relative to left of aircraft - the moon azimuth relative to the left side of the aircraft. Source: Calculated from: moon az-ac Range: +- 180 deg. Orientation: + right of the left side of a/c - left of the left side of a/c

moon az-rt	deg	The moon azimuth - relative to the right side of the aircraft. Source: Calculated from: moon az-ac Range: +- 180 deg. Orientation: + right of the right side of a/c - left of the right side of a/c
lunar zenith	deg	Lunar zenith - the angular distance of the moon from zenith. Source: Calculated from: moon el-ea Range: 0 to 180 deg.
poten temp	deg K	Potential temperature - the temperature that a dry air parcel would have if lowered adiabaticallly to a level of 1,000 mb pressure. Source: Calculated from: sat computed Pressure Range: 171.7 deg. K to 601 deg K
pres alt metric	meter	Pressure altitude in meters - aircraft pressure altitude in meters corresponding to U.S. Standard Atmosphere, 1962. Source: Calculated from: pressure alt Range: XXXXXXXXXXXXXXXXX
cabin alt	ft	Cabin altitude - effective altitude of the aircraft cabin as a function of cabin pressure-as it relates to sea-level. Source: Rosemount Mod 1241 A6CD Range: -1000 to 20,000 ft.

NMS a/p cmd	n/a	Autopilot Command status - computed
		Function returns a flag value which tells
		Which NMS (if either) is currently in
		Command of the autopilot:
		Output message:
		If output =1 then NMS 1 is in command of auto/p
		  Output=2 then NMS2 is in command of auto/p
		  Output=3 then autopilot is OFF
		  Output=4 then an error was detected

Tot air temp	deg C	Total air temperature