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A LOS ANGELES BASIN 1100 AIRCRAFT TRAFFIC MODEL

Dr. Anand D. Mundra

The MITRE CORPORATION
1820 Dolley Madison Boulevard
McLean, Virginia 22102



January 1981

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16. Abstract This document describes a static model of air traffic in the Los Angeles basin in the 1995 time frame. The model is a "snapshot" of a "peak" instant in 1995, i.e., an instant when the greatest number of aircraft are predicted to be seen at any time in 1995 in the Los Angeles basin. Derived from an earlier model, it contains 1105 instantaneously airborne aircraft. Position, velocity, and other relevant descriptors of each aircraft are provided. The model reflects realistic constraints such as topography, expected airspace restrictions, and aircraft performance characteristics. The total number of aircraft predicted in the model is obtained on the basis of historical data and air traffic projections by the Federal Aviation Administration for the Los Angeles basin.			
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
m ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
sq ft	square yards	0.9	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
cm	centimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3	feet	ft
km	kilometers	0.6	miles	mi
		1.2	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.1	square feet	ft ²
km ²	square kilometers	2.6	square miles	mi ²
ha	hectares (10 000 m ²)	2.5	acres	ac
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	sh ton
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	3.4	fluid ounces	fl oz
l	liters	1.06	quarts	qt
m ³	cubic meters	0.76	quarts	qt
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

The figure contains two identical temperature conversion scales. Each scale has two horizontal axes. The top axis is labeled 'Celsius temperature' and ranges from -40 to 200 in increments of 20. The bottom axis is labeled 'Fahrenheit temperature' and ranges from -40 to 400 in increments of 20. Vertical lines connect corresponding values on the two scales: -40°C = -40°F, 0°C = 32°F, 100°C = 212°F, and 200°C = 392°F.

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1. INTRODUCTION

This document describes an air traffic model of the Los Angeles basin projected into the 1995 time frame. The Los Angeles basin is known to be the area of the densest air traffic in the United States at this time. It is expected to continue to be the densest area of air traffic activity in the 1990s. This model is a "snapshot" of air traffic in the Los Angeles basin, and represents air traffic at a "peak" instant in 1995, i.e., an instant which contains the greatest number of aircraft expected to be airborne in that area at any time during 1995. It contains complete position and velocity information on each aircraft in the basin at this peak instant. The model contains 1105 aircraft and is referred to as the LAX-1100 model.

LAX-1100 is derived from an earlier air traffic model of the Los Angeles basin for the same year, described in Reference 1. LAX-1100 revises that model by using current air traffic forecasts, but maintains all the realism inherent in that model such as topographical and airspace constraints, and aircraft performance.

This document briefly describes the methodology for deriving LAX-1100 and its data formats. It also lists each aircraft in the model.

The model is stored on tape number 1218 at the MITRE/Washington Computing Center at 1820 Dolley Madison Boulevard, McLean, Virginia 22102.

2. THE LAX-1100 MODEL

LAX-1100 is derived from an existing and previously widely used traffic model of the 1995 Los Angeles hub described in Reference 1, here referred to as LAX-1840. LAX-1840 makes extensive use of real life information about the Los Angeles basin, such as airport locations, terrain, likely airspace and route restrictions, traffic flows and patterns, aircraft altitude and speed profiles appropriate to their performance categories and flight types. The model was hand made; all this renders the model highly realistic. However, the traffic levels used for building the model were based on the forecasts available in 1972. Air traffic statistics have since experienced a significantly slower rate of growth as a result of the energy crisis. The LAX-1100 model incorporates the latest FAA forecasts. It is based on the LAX-1840 model and maintains all the realism otherwise inherent in that model. Section 2.1 briefly summarizes the relevant methodology of the original LAX-1840 model. Section 2.2 summarizes the new forecasts used for revising LAX-1840. Section 2.3 describes the method used for obtaining LAX-1100.

2.1 Review of LAX-1840 Methodology

Reference 1 uses the growth in the total annual operations in the Los Angeles hub to estimate the growth in the peak instantaneous airborne count (IAC) in the basin. Let N_{71} and N_{95} be the peak IACs for the Los Angeles hub in 1971 and 1995, respectively. Let A_{71} and A_{95} be the total annual operations in the Los Angeles hub for 1971 and 1995, respectively. Then, Reference 1 assumes that

$$\frac{N_{95}}{N_{71}} \approx \frac{A_{95}}{A_{71}}$$

Reference 2 provides a peak IAC of 495 for the base year (actually 1972). Reference 3 shows that this IAC is based on about 82% of the air traffic activity in the basin. Thus, the total basin IAC, N_{71} , was estimated by Reference 1 to be 600. The 1971 annual operations count $A_{71} = 6,357,000$ operations was available from FAA sources. The 1995 operations count, A_{95} , was obtained by the following method:

$$A_{95} = (1+R)^{24} * A_{71}, \text{ where } R \text{ is given by } (1+R)^{10} = A_{83}/A_{73}$$

A_{83} and A_{73} were obtained from FAA Terminal Area forecasts (see Reference 1 for details). This gives $A_{95} = 19,477,000$. Therefore $N_{95} = (19477/6357) * 600 = 1840$. This total IAC count of 1840 was then subdivided into various subgroups in proportion to component operation numbers.

2.2 New Forecast

Reference 1, published in 1974, provides the FAA forecast of air traffic in the Los Angeles basin for the year 1990. (This forecast was published a few years before the airline deregulation act was passed. However, a later forecast is not yet available. Deregulation was expected to affect air carrier fleet projections slightly.) Table 2-1 lists the forecasts from Reference 4 for the years 1985 and 1990 for three types of operations: air carriers, general aviation itinerant, and general aviation local. This is the finest subdivision of operations available in Reference 4. For this study, the operations within each category were projected another five years, to the year 1995, assuming a constant yearly percent growth between 1985 and 1995. These resulting new forecasts for 1995 are also listed in Table 2-1.

Table 2-2 compares these new forecasts to the original 1995 forecasts used in deriving LAX-1840. Military operations are assumed to remain constant at the levels of Reference 1. Table 2-2 shows the ratio of the new forecasts to the old forecasts for each flight category. The new forecast yields a total annual operations count which is about 60% of the old forecast. Thus, maintaining the methodology used in Reference 1, the total number of aircraft in the 1995 Los Angeles basin peak snapshot would be expected to be about 60% of the number in LAX-1840.

2.3 Derivation of LAX-1100

Since Reference 1 assumes a proportionality of the growth in annual operations to peak IAC at all levels, the new forecasts should be reflected in smaller total IACs for the basin in each of the three flight categories of Table 2-2 in the proportions listed there. A random number generator is used to delete aircraft from the LAX-1840 model, as shown in Figure 2-1. The final set of aircraft in the output file LAX-NEW is thus a proper subset of the aircraft in LAX-1840. Each aircraft that is retained in LAX-NEW has all its original coordinate values.

Three different runs were made, with three different starting random number seeds providing three different LAX-NEW models. The three versions had 1074, 1096 and 1105 aircraft respectively. The 1105 aircraft model was chosen as the revised Los Angeles basin model and was named LAX-1100.

TABLE 2-1
1973 AVIATION FORECASTS FOR THE L.A. HUB

Type of Projection	Forecast For Year	Air Carriers	General Aviation	
			Itinerant	Local
FAA (Reference 4)	1980	840	4307	3676
	1980	1014	1323	4060
Geometric Projection	1987	1224	5443	4454

TABLE 2-2

COMPARISON OF FORECASTS

(Annual Operations in Thousands)

	Air Carriers	General Aviation		Military	Total
		Private	Local		
New 1995 Forecast (from Table 2-1)	1210	8997	1030	100	11500
Q14 1995 Forecast (from Tables 3-2 and 3-4 of Reference 1)	1344	8882	6602	400	19400
Scaling Factor	0.911	0.607	0.507	1	



3. DATA FORMATS

The LAX-1100 model consists of 1105 aircraft. The model exists as a series of 1105 card images, each card image consisting of data on one aircraft, and is stored on a 9-track tape.

Section 3.1 describes the format information for reading the tape, and section 3.2 describes the formats for interpreting each card image.

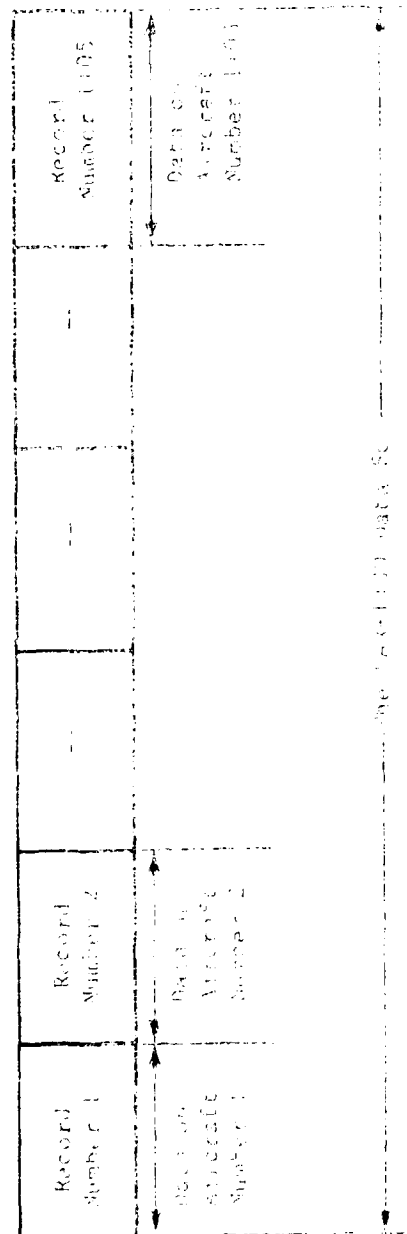
3.1 Tape Format

Tape number 1218 is a 9-track tape and contains the LAX-1100 model. It has been created on an IBM/370 (Model 148) computer running VM/370. The data density is 800 bits per inch. The data set consists of 1105 logical records as shown in Figure 3-1 (see Reference 5 for IBM/370 nomenclature). Each logical record corresponds to a physical record 80 bytes long. Each byte represents an EBCDIC coded alphanumeric character. Each logical record is thus an 80 column card image. A tape mark indicates the end of the data set on the tape.

3.2 Formats For Each Card Image

This section describes the data formats for each card image. Each card image contains complete data on one aircraft. These formats are identical with those necessary to interpret the LAX-1840 model of Reference 1. Reference 1 also contains a description of these formats; however, Reference 1, as published in March 1974, contained an error affecting the interpretation of columns 41 through 53. This error was later corrected by a correction sheet dated September 11, 1974. The formats described in this section incorporate these corrections. The following formats are thus the correct formats:

<u>Item No.</u>	<u>Card Columns</u>	
1	1-4	Aircraft sequence number
2	6-13	Aircraft description code
3	15-17	Departure airport code
4	19-21	Arrival airport code
5	23-39	Aircraft position (x,y,z)
6	41-59	Aircraft velocity ($\dot{x}, \dot{y}, \dot{z}$)
7	61-64	Aircraft heading
8	66-69	Aircraft ground speed
9	71-74	Aircraft turn rate
10	76	Flight plan code
11	78	Flight phase code



Each record is 30 bytes long.
 Record format is 1000 length.

FIGURE 1
LAX-1100 TAPE FORMAT

The interpretation of the data codes and the arithmetic precision and units of measure are included in the following detailed description of each data item:

1. Aircraft sequence number
 Cols: 1-4 nnnn
 Data: a four digit integer ranging from 1 to 1105

2. Aircraft description code
 Cols: 6-13 a₁ a₂ a₃ a₄ nnnn

 Data: Descriptor Category a₁ a₂ a₃ a₄

 Sequence number nnnn within a category

where

<u>Air carrier</u>	a ₁ a ₂ = AC
a ₃ =	T SST L Long haul M Medium haul S Short haul U Ultra-short haul
a ₄ =	H Heavy aircraft L Light aircraft

General Aviation or Military

a ₁ =	V for VFR I for IFR
a ₂ =	I for itinerant L for local O for over
a ₃ =	G for general aviation M for military
a ₄ =	A Single engine 1-3 places B Single engine 4 or more places C Multi-engine under 12,500 pounds D Multi-engine over 12,500 pounds E Turboprop F Turbojet

3. Departure airport code

Cols: 15-17 aaa

Data: One of 48 airport codes (see Table 3-1) or one of eight hub boundary octals (see Figure 3-2) for flights departing from airports outside of the hub.

4. Arrival airport code

Cols: 19-21 aaa

Data: Same as (3). (Hub codes for flights destined for airports outside the hub.)

5. Aircraft positions (x, y, z)

Cols: 23-28, 30-35, 37-39
+ xxx.x, + xxx.x xxx

Data: x coordinate in nautical miles
y coordinate in nautical miles
z coordinate in hundreds of feet

The coordinate system is centered at the LAX VORTAC. The VORTAC is at 33° 55' 59" North Latitude and 118° 25' 52" West Longitude. The x-axis points (true) east and the y-axis points (true) north. Altitudes are referenced to mean sea level.

6. Aircraft velocities ($\dot{y}$, $\dot{x}$, $\dot{z}$)

Cols: 41-46, 48-53, 55-59
+ xxx.x + xxx.x + xxxx

Data: $\dot{y}$ is velocity in knots

$\dot{x}$ is velocity in knots

$\dot{z}$ is climb or descent rate in feet per minute

7. Aircraft heading

Cols: 61-64 xxxx

Data: Aircraft heading from 0 to 359 degrees
(0 = true north, angles increasing clockwise)

8. Aircraft ground speed

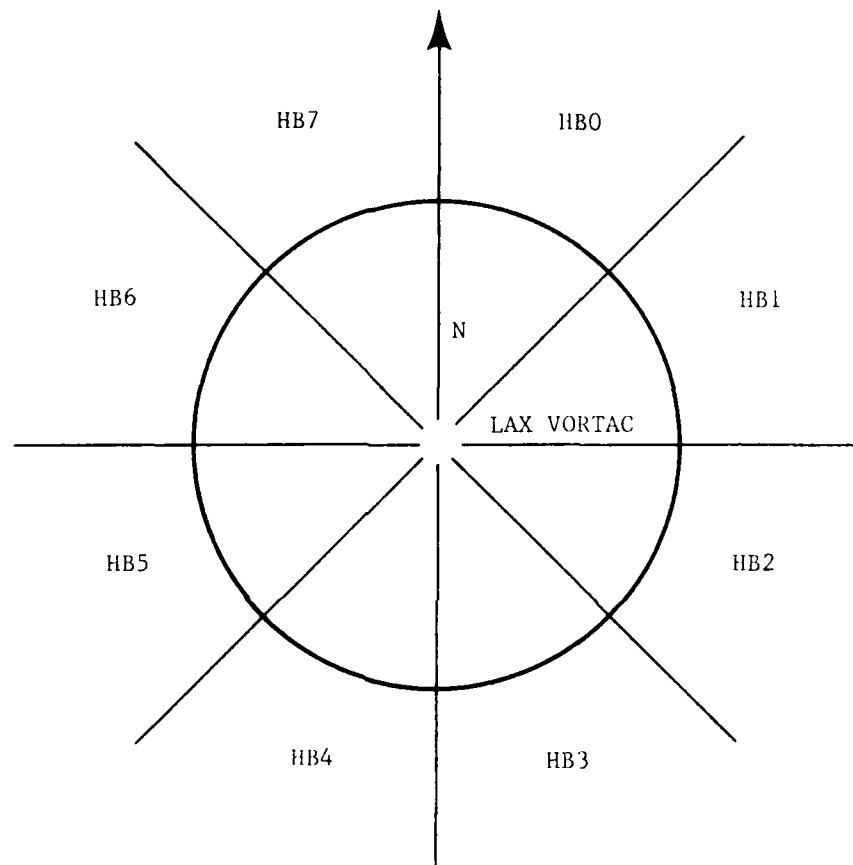
Cols: 66-69 xxxx

Data: Ground speed in knots

TABLE 3-1

AIRPORT CODE LIST

<u>Airport Code</u>		<u>Airport Name</u>	<u>Airport Code</u>	<u>Airport Name</u>	
1.	LCB	Long Beach	25.	L36	Rialto
2.	VNY	Van Nuys	26.	APV	Apple Valley
3.	SNA	Santa Ana	27.	SBD	Norton AFB
4.	LAX	Los Angeles International	28.	L66	Corona
5.	TOA	Torrance	29.	L12	Redlands
6.	SMO	Santa Monica	30.	NZJ	MCAS El Toro
7.	HHR	Hawthorne	31.	X17	Hemet Ryan
8.	BUR	Burbank	32.	SFR	San Fernando
9.	POC	La Verne Brackett	33.	RIR	Fla Bob (Riverside)
10.	CNO	Chino	34.	WHP	Whiteman (L.A.)
11.	EMT	El Monte	35.	X01	Agua Dulce
12.	FUL	Fullerton	36.	X42	Skylark
13.	CPM	Compton	37.	SZP	Santa Paula
14.	X14	George AFB	38.	X32	Quartz Hill
15.	EDW	Edwards AFB	39.	X37	Rosamond
16.	OXR	Oxnard	40.	L38	Capistrano
17.	ONT	Ontario	41.	SBT	Tri City
18.	RAL	Riverside	42.	X25	Morrow
19.	L16	Meadowlark	43.	X15	Hawkins
20.	WJF	Fox	44.	X31	Perris Valley
21.	PMD	Palmdale	45.	X33	Rancho California
22.	L02	Santa Susana	46.	X18	Hesperia Airlodge
23.	CCB	Cable	47.	X44	Sun Hill Ranch
24.	RIV	March AFB	48.	X43	Sterks Ranch



NOTE: The Hub Is Divided Into Eight Equiangular Octals For Arrivals And Departures Across Its Boundaries.

**FIGURE 3-2
HUB OCTAL CODES**

9. Aircraft turn rate

Cols: 71-74 $\pm$ x.x

Data: Turn rate in degrees per second
+ = clockwise
- = counter clockwise

10. Flight plan code

Col: 76 n

Data: n = 1 flight plan filed
n = 0 no flight plan

11. Flight phase code

Col: 78 n

Data: n = 0 Cruise phase
n = 1 Climb phase
n = 2 Descent phase

A complete listing of this data set is provided in Chapter 4.

4. THE SNAPSHOT

Table 4-1 lists the LAX-1100 model.

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

4-2

TABLE 4-1
(Continued)

SEQN	AIRCRAFT	DESCRIPT	AIRPORT	AIRCRAFT POSITION			AIRCRAFT VELOCITY			GRND TURN C/L		
				N MI	N MI	FT-00	KNOTS	KNOTS	FT/MIN	SPD	RATE	U/D
NO.	CODE	DEP	ARR	-X-	-Y-	-Z-	-X-	-Y-	-Z-	DEGS	KTS	UG/SC
12345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678	0012345678
51	ACJL0009	LAX	UNT	39.3	-3.1	90	66.9	218.9	-1150	73	229	0.0 1 2
52	ACJL0009	LAX	UNT	47.2	8.2	25	-3.6	-233.9	-1050	269	209	0.0 1 2
53	ACJL0010	LAX	HAL	54.1	0.3	30	41.6	-246.3	-1500	280	240	0.0 1 2
54	ACJL0011	LAX	PMO	12.7	30.0	150	201.5	35.5	1100	73	219	0.0 1 1
55	ACMH0024	UNT	HBI	48.2	23.4	105	183.4	196.7	2250	47	269	0.0 1 1
56	ACMH0025	HPS	UNT	50.3	0.3	56	72.8	238.0	-1400	73	249	0.0 1 2
57	ACSL0012	HPS	UNT	52.0	-22.7	130	210.4	-76.6	-1100	340	224	0.0 1 2
58	ACSL0013	HPS	UNT	17.5	-6.5	125	64.0	209.4	-1100	73	219	0.0 1 2
59	ACSL0014	HPS	UNT	37.2	35.1	210	-144.8	214.7	-1300	124	259	0.0 1 2
60	ACSL0015	HBI	UNT	71.0	45.8	250	-183.4	-196.7	-1350	227	269	0.0 1 2
61	ACSL0016	UNT	HBO	32.0	23.8	140	224.5	81.7	2000	70	239	0.0 1 1
62	ACSL0017	UNT	HBT	3.7	22.0	90	198.4	-166.4	2200	320	259	0.0 1 1
63	ACJL0012	UNT	LGB	24.4	-3.6	41	-210.4	-76.6		700	224	0.0 1 1
64	ACJL0013	UNT	SNA	37.6	5.8	30	-167.7	-190.7	1800	220	219	0.0 1 1
65	ACJL0014	UNT	SNA	31.7	-3.9	50	-198.3	-114.4	1350	210	229	0.0 1 1
66	ACJL0015	UNT	LAX	13.1	2.0	31	-22.3	-212.8	-600	264	214	0.0 1 2
67	ACJL0017	UNT	LAX	23.8	5.1	62	-205.7	-74.9	-1100	200	214	0.0 1 2
68	ACMH0026	HPS	PMO	24.4	43.4	40	-54.2	-221.1	-1150	255	229	0.0 1 2
69	ACMH0027	HPS	PMO	65.4	54.1	140	-72.2	-264.4	-1400	255	274	0.0 1 0
70	ACMH0028	HPS	PMO	-39.6	7.4	210	0.0	270.0	-1400	90	279	0.0 1 2
71	ACMH0029	PMO	HBI	34.1	30.3	250	124.5	215.6	2100	60	249	0.0 1 2
72	ACMH0030	PMO	HBI	37.9	44.8	220	92.0	252.7	2300	70	269	0.5 1 1
73	ACMH0031	PMO	HBT	-25.5	57.4	315	287.8	-77.1	2500	345	294	0.0 1 1
74	ACSL0018	HBI	PMO	41.7	47.9	75	-61.8	-230.8	-1200	255	239	0.0 1 2
75	ACSL0019	HBT	PMO	3.4	55.1	110	-24.3	277.9	-1400	95	274	0.0 1 2
76	ACSL0020	HBT	PMO	52.4	-24.5	200	232.9	-134.5	-900	430	269	0.0 1 2
77	ACSL0022	PMO	HBI	14.4	41.3	28	-71.4	-136.3	1725	250	209	0.0 1 1
78	ACSL0023	PMO	HBI	12.7	34.0	70	-39.7	-225.5	1900	260	229	-2.0 1 1
79	ACSL0024	PMO	HBI	49.7	41.1	220	135.7	235.6	2100	65	249	0.0 1 1
80	ACSL0025	PMO	HPS	24.2	-32.0	45	-228.1	142.5	2200	149	269	0.0 1 1
81	ACJL0019	PMO	LAX	7.2	31.7	100	-251.1	-67.2		195	260	0.0 1 0
82	ACMH0032	HPS	SNA	33.4	-7.3	30	-198.3	-114.4	-600	210	229	0.0 1 2
83	ACMH0033	HPS	SNA	65.4	14.4	195	-169.4	-142.1	-1250	227	249	0.0 1 2
84	ACMH0034	SNA	HPS	25.5	-14.6	20	-172.3	-79.4	1500	210	199	0.0 1 1
85	ACMH0035	SNA	HPS	25.1	-3.7	150	240.5	54.4	2100	15	249	0.0 1 0
86	ACSL0027	HPS	SNA	24.3	-12.7	7	-189.6	-109.4	-1100	210	219	0.0 1 2
87	ACSL0028	HPS	SNA	36.5	0.3	42	-198.3	-114.4	-600	210	229	0.0 1 2
88	ACSL0029	HPS	SNA	61.4	31.0	155	-68.5	-243.3	-1250	250	254	0.0 1 2
89	ACSL0030	HPS	SNA	27.5	14.4	115	-49.5	221.5	-1200	112	239	0.0 1 2
90	ACSL0031	SNA	HPS	37.4	-17.9	115	44.3	244.8	2150	71	259	0.3 1 1
91	ACSL0032	SNA	HPS	43.7	14.4	35	143.7	160.0	-1200	40	249	0.6 1 2
92	ACSL0033	SNA	HPS	63.3	42.4	320	173.5	206.8		50	270	0.0 1 0
93	ACSL0034	SNA	HPS	31.7	-36.2	110	-224.1	142.5	2200	148	269	0.0 1 1
94	ACJL0027	SNA	LAX	14.6	-15.8	40	236.3	-41.6		350	240	0.0 1 0
95	ACJL0021	SNA	LAX	14.4	-2.4	35	180.9	-104.5	-525	330	209	0.0 1 2
96	ACJL0022	SNA	LAX	5.1	1.3	12	-71.4	-196.3	-1050	250	209	0.5 1 2
97	ACJL0023	SNA	LAX	17.2	-4.2	40	82.0	-225.5		290	240	0.0 1 0
98	ACJL0024	SNA	HPS	17.7	-1.0	40	225.5	-34.7	-1150	350	229	0.0 1 2
99	ACJL0026	SNA	UNT	43.1	7.5	12	-3.4	-195.9	-600	269	199	0.0 1 2
100	ACJL0027	HPS	SNA	45.5	-21.7	40	119.9	-207.8		300	240	0.0 0 0

TABLE 4-1
(Continued)

SEQN	AIRCRAFT DESCRPT	AIRPORT	AIRCRAFT POSITION			AIRCRAFT VELOCITY			GND TURN		
			N	M	FT-30	KNOTS	KNOTS	FT/MN	BRNG	SPD	RATE
			-X-	-Y-	-Z-	-X-	-Y-	-Z-	DEGS	KTS	DEG/SEC
121	5678	0123456789012345678901234567890123456789012345678901234567890									
101	ACJL00029	SNA HPI	62.6	36.2	110	154.2	143.8	0	50	240	0.0 1 0
102	ACJL00037	HST AOR	-32.7	43.7	215	-224.4	157.1	-1375	145	274	0.0 1 2
103	ACJL00038	HST AOR	32.0	-32.0	135	-172.9	-200.0	-1350	230	269	0.0 1 2
104	ACJL00039	HST HPT	0.0	15.5	25	-17.3	-190.2	1700	265	199	0.0 1 1
105	ACJL00040	HST HPT	-18.2	28.6	170	257.2	-54.3	2200	347	264	0.0 1 1
106	ACJL00036	HST AOR	-1.7	25.8	115	-243.6	12.7	-1200	177	244	0.0 1 2
107	ACJL00037	HST HPI	58.2	43.6	130	116.2	247.2	0	65	275	0.0 1 0
108	ACJL00038	AOR HPT	-16.2	23.1	130	238.6	-46.5	2100	340	254	1.0 1 1
109	ACJL00030	HST LPS	17.7	-12.0	70	-39.5	226.5	0	130	230	0.0 1 0
110	ACJL00031	AOR SNA	-2.0	7.2	30	-205.7	74.9	1800	160	219	0.0 1 1
111	ACJL00032	HST FAL	50.7	3.1	10	-177.6	195.5	-1000	125	240	2.5 1 2
112	ACJL00039	HST LPS	23.4	-15.1	32	143.6	-165.2	-1100	311	219	0.0 1 2
113	ACJL00033	LAX LAX	12.7	-5.5	10	115.0	-137.1	1000	319	179	0.0 1 1
114	ACJL00034	LAX AOR	13.4	11.6	42	107.0	145.3	-540	0	214	-2.0 1 2
115	ACJL00035	LAX FXX	-24.2	16.5	60	0.0	-209.0	-1050	270	204	0.0 1 2
116	ACJL00036	LPS HPT	57.2	5.5	40	0.0	231.0	-250	0	230	-3.0 1 2
117	ACJL00037	FAL LAX	44.4	2.7	60	43.4	-246.2	0	240	250	0.0 1 0
118	ACJL00034	FAL AOR	23.1	11.3	60	160.0	-190.7	-1000	310	249	0.0 1 2
119	ACJL00039	HST LPS	-10.3	11.3	40	-105.6	226.5	0	115	250	0.0 1 0
120	HF00001	HST LPS	-5.1	14.2	49	-42.7	117.4	0	110	125	0.0 1 0
121	HF00002	HST LAX	20.3	2.4	43	-15.0	-143.2	0	264	144	0.0 1 0
122	HF00003	HST LAX	32.0	4.2	60	-69.9	-121.2	0	240	140	0.0 1 0
123	HF00005	LAX HPT	5.8	41.3	78	128.0	72.5	0	10	130	0.0 1 0
124	HF00006	HST SNA	23.4	6.2	50	-9.0	-129.6	0	266	130	0.0 1 0
125	HF00007	LPS AOR	8.4	7.2	41	100.6	-65.3	0	327	120	0.0 1 0
126	HF00008	LAX HPT	14.4	3.4	52	61.0	137.0	0	46	150	0.0 1 0
127	HF00009	HST HPT	39.3	2.0	54	113.7	-63.0	0	331	130	0.0 1 0
128	HF00010	LAX HPT	28.2	4.8	51	17.0	144.9	0	83	140	0.0 1 0
129	HF00011	HST HPT	22.4	13.0	50	20.1	143.5	0	82	145	0.0 1 0
130	HF00012	SNA LPS	43.1	-3.7	25	37.5	120.5	-600	54	149	-3.0 1 2
131	HF00013	LAX LPS	22.7	2.0	67	24.2	153.0	0	81	155	0.0 1 0
132	HF00014	HPI LPS	55.3	0.6	57	-20.1	-127.4	-750	261	129	0.0 1 2
133	HF00015	FAL LPS	33.4	-1.3	42	-55.3	-160.7	0	251	170	0.0 1 0
134	HF00016	LAX HPT	41.3	21.7	49	-102.1	206.4	0	117	225	0.0 1 0
135	HF00017	LAX SNA	16.2	-13.1	33	-49.1	167.7	0	118	190	0.0 1 0
136	HF00018	FAL SNA	46.9	-5.8	40	-95.3	-147.1	0	243	210	0.0 1 0
137	HF00019	SNA LAX	18.6	-13.4	41	141.7	-118.9	0	320	185	0.0 1 0
138	HF00020	HST LAX	12.4	8.6	51	-124.7	63.5	0	153	140	0.0 1 0
139	HF00021	FAL LAX	34.4	1.7	63	-17.8	-204.2	0	265	205	0.0 1 0
140	HF00022	HST LAX	5.5	25.5	60	-128.3	-20.3	0	189	150	0.0 1 0
141	HF00023	LAX HPT	-27.2	42.0	63	168.8	-97.5	0	340	195	0.0 1 0
142	HF00024	LPS HPT	24.8	-1.3	60	3.6	-164.7	0	273	165	0.0 1 0
143	HF00025	HST HPT	14.3	12.0	54	39.5	-145.8	0	282	190	0.0 1 0
144	HF00026	LPS AOR	14.4	9.6	52	31.0	-166.2	0	296	185	0.0 1 0
145	HF00027	HPI HPT	65.5	25.8	79	-47.8	-174.6	0	255	185	0.0 1 0
146	HF00028	LPS HPT	24.8	-4.8	32	148.5	212.1	1200	55	259	0.0 1 1
147	HF00029	LAX HPT	42.4	3.1	25	49.2	135.3	-1200	70	144	-1.0 1 2
148	HF00030	HST HPT	7.4	33.1	98	-130.0	-117.0	0	222	175	0.0 1 0
149	HF00031	HST HPT	-7.4	55.1	79	180.0	-151.0	0	320	235	0.0 1 0
150	HF00032	HST LPS	14.2	20.6	68	-127.9	119.3	0	137	175	0.0 1 0

TABLE 1
CONTINUED

AIRCRAFT		AIRCRAFT POSITION		AIRCRAFT VELOCITY		AIRCRAFT TURN		AIRCRAFT TURN	
NO.	TYPE	ALTITUDE	HEADING	VELOCITY	ANGLE	TURN RATE	TURN RATE	TURN RATE	TURN RATE
NO.	TYPE	ALTITUDE	HEADING	VELOCITY	ANGLE	TURN RATE	TURN RATE	TURN RATE	TURN RATE
121	5478	111	111	111	111	111	111	111	111
151	111	111	111	111	111	111	111	111	111
152	111	111	111	111	111	111	111	111	111
153	111	111	111	111	111	111	111	111	111
154	111	111	111	111	111	111	111	111	111
155	111	111	111	111	111	111	111	111	111
156	111	111	111	111	111	111	111	111	111
157	111	111	111	111	111	111	111	111	111
158	111	111	111	111	111	111	111	111	111
159	111	111	111	111	111	111	111	111	111
160	111	111	111	111	111	111	111	111	111
161	111	111	111	111	111	111	111	111	111
162	111	111	111	111	111	111	111	111	111
163	111	111	111	111	111	111	111	111	111
164	111	111	111	111	111	111	111	111	111
165	111	111	111	111	111	111	111	111	111
166	111	111	111	111	111	111	111	111	111
167	111	111	111	111	111	111	111	111	111
168	111	111	111	111	111	111	111	111	111
169	111	111	111	111	111	111	111	111	111
170	111	111	111	111	111	111	111	111	111
171	111	111	111	111	111	111	111	111	111
172	111	111	111	111	111	111	111	111	111
173	111	111	111	111	111	111	111	111	111
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175	111	111	111	111	111	111	111	111	111
176	111	111	111	111	111	111	111	111	111
177	111	111	111	111	111	111	111	111	111
178	111	111	111	111	111	111	111	111	111
179	111	111	111	111	111	111	111	111	111
180	111	111	111	111	111	111	111	111	111
181	111	111	111	111	111	111	111	111	111
182	111	111	111	111	111	111	111	111	111
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187	111	111	111	111	111	111	111	111	111
188	111	111	111	111	111	111	111	111	111
189	111	111	111	111	111	111	111	111	111
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192	111	111	111	111	111	111	111	111	111
193	111	111	111	111	111	111	111	111	111
194	111	111	111	111	111	111	111	111	111
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196	111	111	111	111	111	111	111	111	111
197	111	111	111	111	111	111	111	111	111
198	111	111	111	111	111	111	111	111	111
199	111	111	111	111	111	111	111	111	111
200	111	111	111	111	111	111	111	111	111

1. *Abstract* 2. *Introduction* 3. *Methods* 4. *Results* 5. *Discussion* 6. *Conclusion* 7. *References*

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10. *Chrysomelidae* (1000)

4-7

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

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TABLE 2 (Cont.)

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E. coli, *Shigella*

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(Cont. unrepd.)

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(Continued)

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TABLE G-1
(Continued)

AIRCRAFT			AIRCRAFT POSITION			AIRCRAFT VELOCITY			GRND TURN C C		
SEQN	DESCRPT	AIRPORT	N MI	N MI	FT-00	KNOTS	KNITS	FT/MN	BRNG	SPD	RATE
NPL	CODE	DEP ARR	-X-	-Y-	-Z-	-Y-	-X-	-Z-	DEGS	KTS	DU/SC
123456789012345678901234567890123456789012345678901234567890											
601	VIG00072	X31 L66	50.7	3.4	23	16.9	-194.2	0	275	195	0.0 0 0
602	VIG00073	H81 L12	71.0	12.0	70	-83.6	-99.6	-600	220	130	0.0 0 2
603	VIG00074	VNY L12	14.8	21.0	78	-15.2	174.3	0	95	175	0.0 1 0
604	VIG00075	SNA L12	55.5	-10.3	77	120.2	120.2	0	45	170	0.0 0 0
605	VIG00076	LGR X17	24.1	-9.6	52	0.0	220.0	0	40	220	0.0 0 0
606	VIG00077	SFR H87	-0.6	38.2	64	107.2	-89.9	0	320	140	0.0 0 0
607	VIG00078	H81 SFR	-11.0	37.9	85	-147.2	85.0	0	150	170	0.0 0 0
608	VIG00081	L32 R1P	12.4	22.7	94	-23.4	132.9	0	100	135	0.0 0 0
609	VIG00082	X32 R1P	26.9	36.9	73	-116.6	116.6	0	135	165	0.0 0 0
610	VIG00083	X33 R1P	63.1	4.1	33	148.7	-39.8	1500	345	154	0.0 0 0
611	VIG00084	HXR WHP	-16.5	16.5	51	61.5	169.1	0	70	180	0.0 0 0
612	VIG00086	HAL WHP	7.7	12.0	43	92.4	-160.2	0	300	185	0.0 0 0
613	VIG00088	HUK X01	6.2	36.5	40	172.3	99.4	-1500	30	149	-3.0 0 2
614	VIG00090	X44 X01	35.1	36.5	67	-56.4	-155.0	0	250	165	0.0 0 0
615	VIG00091	X43 X42	35.1	25.5	91	-138.5	80.0	0	150	160	0.0 1 0
616	VIG00092	H86 SZP	-41.0	22.4	50	20.6	117.1	-1000	80	119	0.0 0 2
617	VIG00093	HJF SZP	-17.2	40.7	62	-74.9	-129.9	0	240	150	0.0 1 0
618	VIG00094	CCR SZP	27.5	22.4	86	46.1	-126.8	0	290	135	0.0 0 0
619	VIG00097	X37 H87	2.4	57.2	50	31.0	-176.2	1000	280	179	0.0 0 1
620	VIG00098	APV L3R	53.1	9.6	81	-137.8	-24.3	0	190	140	0.0 1 0
621	VIG00101	VNY S8T	25.3	19.3	71	0.0	155.0	0	90	155	0.0 0 0
622	VIG00104	PMO X25	52.4	22.7	73	-107.2	89.9	0	140	140	0.0 0 0
623	VIG00105	SMO X15	12.7	28.2	76	130.2	109.2	0	40	170	0.0 0 0
624	VIG00106	FMT X15	9.3	14.8	52	96.4	-114.9	0	310	150	0.0 1 0
625	VIG00107	FUL X31	41.7	2.4	57	59.8	164.4	0	70	175	0.0 0 0
626	VIG00108	HJR X33	22.4	-1.7	92	-162.6	162.6	0	135	230	0.0 1 0
627	VIG00109	PIC X18	55.8	17.2	57	112.4	112.4	400	45	159	0.0 0 0
628	VIG00001	RAL LGB	6.4	-6.2	47	-129.4	-108.6	1000	220	169	0.0 0 1
629	VIG00003	TJA H81	57.9	2.0	95	93.2	111.0	0	50	145	0.0 1 0
630	VIG00004	H81 PGC	60.0	18.6	105	-107.2	-89.9	0	220	140	0.0 0 0
631	VIG00002	VNY H87	-13.7	65.5	68	144.7	-52.6	-1500	340	154	0.0 0 0
632	VIG00003	H81 HHR	42.0	1.3	101	-87.4	-151.5	0	240	175	0.0 1 0
633	VIG00004	PMO DNT	34.4	40.3	57	-116.6	116.6	0	135	165	0.0 0 0
634	IOGA0001	H86 H83	-3.1	3.4	101	-80.3	95.7	0	130	125	0.0 1 0
635	IOGA0002	H86 H83	-42.4	25.5	49	-68.8	98.2	0	125	120	0.0 1 0
636	IOGA0003	H87 H81	17.9	39.3	69	-39.3	108.0	0	110	115	0.0 1 0
637	IOGA0006	H82 H86	-37.9	21.3	59	-11.7	-134.4	0	265	135	0.0 1 0
638	IOGA0007	H86 H82	43.1	8.6	50	-64.9	112.5	0	120	130	0.0 1 0
639	IOGF0001	H82 H86	6.2	14.8	72	147.4	-147.4	0	316	205	0.0 1 0
640	IOGF0002	H82 H80	31.0	8.6	71	207.2	-133.7	0	326	250	0.0 1 0
641	IOGF0003	H80 H82	10.6	18.6	60	-246.2	43.4	0	170	250	0.0 1 0
642	IOGF0004	H87 H82	37.9	27.5	101	-153.6	175.5	0	133	240	0.0 1 0
643	IOGF0005	H82 H87	57.6	10.3	99	111.8	-165.8	0	304	200	0.0 1 0
644	IOGF0001	H86 H81	2.0	11.0	230	-33.9	383.5	0	95	390	0.0 1 0
645	IOGF0002	H81 H86	34.4	24.1	140	190.1	-407.8	0	295	450	0.0 1 0
646	IOGF0003	H87 H81	32.0	19.6	119	-95.6	414.1	0	103	425	0.0 1 0
647	VOGE0001	H86 H83	-20.6	7.9	111	-135.1	216.2	0	122	255	0.0 1 0
648	VOGE0003	H87 H83	-18.9	55.1	105	-102.5	102.5	0	135	145	0.0 1 0
649	VOGE0004	H87 H82	53.1	7.9	80	-126.9	88.9	0	145	155	0.0 1 0
650	VOGF0005	H81 H86	18.6	34.4	90	5.7	-164.8	0	272	165	0.0 1 0

1. 100% (1000000)

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$$E_{\text{eff}} = \frac{E}{1 + \frac{1}{\beta} \left(\frac{1}{\alpha} - 1 \right)}$$
[illegible]

1. *Chlorophyll a* and *Chlorophyll b* contents were determined by spectrophotometry using the method of Lichtenthaler and Whistler (1973).

[illegible]

1. The following information was obtained from the records of the
 2. Bureau of the Census, Department of Commerce, Bureau of Economic
 3. Analysis, Office of Statistics, Washington, D. C., for the
 4. period ending June 30, 1944:

State	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Alabama	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	49.0	49.1	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9	50.0	50.1	50.2	50.3	50.4	50.5	50.6	50.7	50.8	50.9	51.0	51.1	51.2	51.3	51.4	51.5	51.6	51.7	51.8	51.9	52.0	52.1	52.2	52.3	52.4	52.5	52.6	52.7	52.8	52.9	53.0	53.1	53.2	53.3	53.4	53.5	53.6	53.7	53.8	53.9	54.0	54.1	54.2	54.3	54.4	54.5	54.6	54.7	54.8	54.9	55.0	55.1	55.2	55.3	55.4	55.5	55.6	55.7	55.8	55.9	56.0	56.1	56.2	56.3	56.4	56.5	56.6	56.7	56.8	56.9	57.0	57.1	57.2	57.3	57.4	57.5	57.6	57.7	57.8	57.9	58.0	58.1	58.2	58.3	58.4	58.5	58.6	58.7	58.8	58.9	59.0	59.1	59.2	59.3	59.4	59.5	59.6	59.7	59.8	59.9	60.0	60.1	60.2	60.3	60.4	60.5	60.6	60.7	60.8	60.9	61.0	61.1	61.2	61.3	61.4	61.5	61.6	61.7	61.8	61.9	62.0	62.1	62.2	62.3	62.4	62.5	62.6	62.7	62.8	62.9	63.0	63.1	63.2	63.3	63.4	63.5	63.6	63.7	63.8	63.9	64.0	64.1	64.2	64.3	64.4	64.5	64.6	64.7	64.8	64.9	65.0	65.1	65.2	65.3	65.4	65.5	65.6	65.7	65.8	65.9	66.0	66.1	66.2	66.3	66.4	66.5	66.6	66.7	66.8	66.9	67.0	67.1	67.2	67.3	67.4	67.5	67.6	67.7	67.8	67.9	68.0	68.1	68.2	68.3	68.4	68.5	68.6	68.7	68.8	68.9	69.0	69.1	69.2	69.3	69.4	69.5	69.6	69.7	69.8	69.9	70.0	70.1	70.2	70.3	70.4	70.5	70.6	70.7	70.8	70.9	71.0	71.1	71.2	71.3	71.4	71.5	71.6	71.7	71.8	71.9	72.0	72.1	72.2	72.3	72.4	72.5	72.6	72.7	72.8	72.9	73.0	73.1	73.2	73.3	73.4	73.5	73.6	73.7	73.8	73.9	74.0	74.1	74.2	74.3	74.4	74.5	74.6	74.7	74.8	74.9	75.0	75.1	75.2	75.3	75.4	75.5	75.6	75.7	75.8	75.9	76.0	76.1	76.2	76.3	76.4	76.5	76.6	76.7	76.8	76.9	77.0	77.1	77.2	77.3	77.4	77.5	77.6	77.7	77.8	77.9	78.0	78.1	78.2	78.3	78.4	78.5	78.6	78.7	78.8	78.9	79.0	79.1	79.2	79.3	79.4	79.5	79.6	79.7	79.8	79.9	80.0	80.1	80.2	80.3	80.4	80.5	80.6	80.7	80.8	80.9	81.0	81.1	81.2	81.3	81.4	81.5	81.6	81.7	81.8	81.9	82.0	82.1	82.2	82.3	82.4	82.5	82.6	82.7	82.8	82.9	83.0	83.1	83.2	83.3	83.4	83.5	83.6	83.7	83.8	83.9	84.0	84.1	84.2	84.3	84.4	84.5	84.6	84.7	84.8	84.9	85.0	85.1	85.2	85.3	85.4	85.5	85.6	85.7	85.8	85.9	86.0	86.1	86.2	86.3	86.4	86.5	86.6	86.7	86.8	86.9	87.0	87.1	87.2	87.3	87.4	87.5	87.6	87.7	87.8	87.9	88.0	88.1	88.2	88.3	88.4	88.5	88.6	88.7	88.8	88.9	89.0	89.1	89.2	89.3	89.4	89.5	89.6	89.7	89.8	89.9	90.0	90.1	90.2	90.3	90.4	90.5	90.6	90.7	90.8	90.9	91.0	91.1	91.2	91.3	91.4	91.5	91.6	91.7	91.8	91.9	92.0	92.1	92.2	92.3	92.4	92.5	92.6	92.7	92.8	92.9	93.0	93.1	93.2	93.3	93.4	93.5	93.6	93.7	93.8	93.9	94.0	94.1	94.2	94.3	94.4	94.5	94.6	94.7	94.8	94.9	95.0	95.1	95.2	95.3	95.4	95.5	95.6	95.7	95.8	95.9	96.0	96.1	96.2	96.3	96.4	96.5	96.6	96.7	96.8	96.9	97.0	97.1	97.2	97.3	97.4	97.5	97.6	97.7	97.8	97.9	98.0	98.1	98.2	98.3	98.4	98.5	98.6	98.7	98.8	98.9	99.0	99.1	99.2	99.3	99.4	99.5	99.6	99.7	99.8	99.9	100.0	100.1	100.2	100.3	100.4	100.5	100.6	100.7	100.8	100.9	101.0	101.1	101.2	101.3	101.4	101.5	101.6	101.7	101.8	101.9	102.0	102.1	102.2	102.3	102.4	102.5	102.6	102.7	102.8	102.9	103.0	103.1	103.2	103.3	103.4	103.5	103.6	103.7	103.8	103.9	104.0	104.1	104.2	104.3	104.4	104.5	104.6	104.7	104.8	104.9	105.0	105.1	105.2	105.3	105.4	105.5	105.6	105.7	105.8	105.9	106.0	106.1	106.2	106.3	106.4	106.5	106.6	106.7	106.8	106.9	107.0	107.1	107.2	107.3	107.4	107.5	107.6	107.7	10

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TABLE 4-1
(Continued)

AIRCRAFT			AIRCRAFT POSITION				AIRCRAFT VELOCITY				GRD TURN C L						
SEQ	DESCRPT	AIRPORT	N	MI	N	MI	FT-03	KNOTS	KNOTS	FT/MN	HRNG	SPD	KATE	1	2	3	4
NO.	CODE	DEP	ARR	-X-	-Y-	-Z-	-Y-	-X-	-Z-	DEFS	KTS	00/50	1	2	3	4	
12345678901234567890123456789012345678901234567890123456789012345678901234567890																	
1101	ILMD0001	FDW	FDW	37.9	65.5	60	-56.2	-110.4	-1200	243	124	0.0	0	2			
1102	ILME0001	PMO	PMO	-3.4	53.1	82	-157.6	123.1	0	142	200	0.0	0	1			
1103	ILME0001	X14	X14	51.7	44.8	45	-149.0	0.0	-1500	180	149	0.0	0	2			
1104	ILME0002	X14	X14	31.0	62.0	60	-125.4	326.7	0	111	350	0.0	0	0			
1105	ILME0003	FDW	FDW	18.6	66.5	120	297.2	-267.6	0	318	400	0.0	0	0			

APPENDIX A

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