

Private Fuel Storage, L.L.C.

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September 3, 1999

COMMITMENT RESOLUTION LETTER #17
DOCKET NO. 72-22 / TAC NO. L22462
PRIVATE FUEL STORAGE FACILITY
PRIVATE FUEL STORAGE L.L.C.

In the August 19, 1999 telephone call between Private Fuel Storage (PFS) and the NRC, the NRC asked additional questions regarding projected future growth in civilian and military air traffic, use of flight termination systems for cruise missiles, and information on a recent cruise missile incident. The NRC questions and the PFS response are provided below:

NRC Comments

1. PFS should provide any available information on the cruise missile incident of June 11, 1999.
2. PFS should include projected air traffic growth rates (civilian and military) in the aircraft crash hazard assessment for the Private Fuel Storage Facility (PFSF).
3. PFS should address the issue of apparently conflicting information from the Air Force concerning use of the cruise missile Flight Termination System on the UTTR.

PFS Response

PFS response to the above comments is enclosed. If you have any questions regarding this response, please contact me at 303-741-7009.

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Enclosure

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PFS RESPONSES TO NUCLEAR REGULATORY COMMISSION

SEPTEMBER 3, 1999

NRC COMMENT 1: PFS should provide information on the cruise missile incident of June 11, 1999.

PFS RESPONSE: The June 11, 1999 cruise missile mishap is currently under investigation by the U.S. Air Force. The Air Force will not release any information until the Safety Investigation Board has completed its work and published its report. PFS has been advised that Part I of the Safety Investigation Report can be released upon completion of the report; the remainder of the report will be classified. PFS has sent a Freedom of Information request to the U.S. Air Force requesting a copy of Part I of the Safety Investigation Report when it is completed as well as any other releasable documents or records pertaining to the June 11, 1999 cruise missile mishap. PFS will provide the NRC Staff with any information it receives in the future regarding the cruise missile incident. PFS expects that it will be a month or more before it receives any such information.

NRC COMMENT 2: PFS should include projected air traffic growth rates (civilian and military) in the aircraft crash hazard assessment for the Private Fuel Storage Facility (PFSF).

PFS RESPONSE:

Commercial Air Carriers

According to the FAA's "Long-Range Aerospace Forecasts, Fiscal Years 2015, 2020 and 2025," FAA-APO-99-5 (June 1999), commercial aircraft operations (the sum of air carrier and commuter/air taxi takeoffs and landings) at all U.S. airports, towered and non-towered, are projected to increase from 28.6 million 1998 to 36.6 million in 2010, and to 47.6 million in 2025. Thus, U.S. commercial aviation operations are projected to increase by a factor of 1.66 by 2025. These forecasts are the products of projected annual average growth rates of 2.1 percent through 2010 and 1.8 percent from 2010 to 2025.

(Tab A, p. 12)

One can apply the growth factor of 1.66 to PFS's estimated crash impact probability for commercial aircraft on airways J-56 and V-257, in that the probability of impact is directly proportional to the number of aircraft flights on those airways and one can assume that the number of flights will increase at the same rate as the total numbers of takeoffs and landings.

In PFS's submission of August 13, 1999, PFS indicated that the crash impact probabilities for aircraft flying on J-56 and V-257 were 8.4×10^{-9} and 5.3×10^{-9} , respectively, for the PFSF cask storage area and 2.2×10^{-9} and 1.4×10^{-9} , respectively, for the PFSF canister transfer building (August 13, 1999 submission at 43).

Multiplying those probabilities by 1.66 yields projected crash impact probabilities for 2025 of 1.39×10^{-8} and 8.80×10^{-9} for the cask storage area from aircraft in J-56 and V-257, respectively, and probabilities of 3.65×10^{-9} and 2.32×10^{-9} for the canister transfer building from aircraft on J-56 and V-257, respectively. One can see from the August 13 submission that crashes involving aircraft from J-56 and V-257 constitute a very small fraction of the total crash impact hazard to the PFSF, less than four percent. Hence, an

increase in those probabilities of 66 percent represents only a very small increase in the total crash impact hazard, which remains well below 1×10^{-6} .

General Aviation Aircraft

The annual number of general aviation operations (takeoffs plus landings) at all towered and non-towered airports in the United States is forecast by the FAA to increase from 87.4 million in 1998 to 92.8 million in 2010 and to 99.2 million in 2025. (*Tab A, p. 12*) Thus general aviation operations are projected to increase by a factor of 1.14 by 2025. These forecasts are the products of a projected average annual growth rate of 0.5 percent per year from 1998 to 2025.

If one applies the growth factor of 1.14 to the crash impact probabilities for the PFSF that PFS provided in its August 13 submission (pg. 43), the impact probability for general aviation aircraft increases from 4.0×10^{-9} to 4.56×10^{-9} for the cask storage area and from 7.1×10^{-10} to 8.09×10^{-10} for the canister transfer building. These increases are very small compared to the total air crash impact hazard PFS has calculated for the PFSF.

The forecast for general aviation flight operations relies not only on the assumptions of sustained economic growth and price stability, but is also heavily dependent on continued plant expansion and production by general aviation manufacturers and the success of industry programs, such as "GA Team 2000," to foster the growth in number of student pilots. If the general aviation industry falters in its efforts to stimulate the production of new general aviation products and services, the outlook for general aviation activity at FAA air traffic facilities could be considerably lower than the current projections. Therefore, the PFS projections of the hazard posed by general aviation aircraft in 2025 is believed to be conservative.

Military Aircraft

Military air traffic is not expected to increase appreciably, if at all, in the foreseeable future. In its official "Long Range Aerospace Forecasts," the Federal Aviation Administration has specifically stated that "[t]he number of military aircraft handled is forecast to remain constant at the 4.2 million recorded in 1998 through 2025." FAA-

APO-99-5, at 16 (**Tab A**).¹ Therefore, the air crash impact probabilities provided for military aircraft by PFS in its August 13 submission should apply throughout the license period of the PFSF.

The FAA's forecast is consistent with, and indeed may be conservative in light of the end of the Cold War and competing national priorities which have produced decreases in defense spending, force structure and personnel for several years. Improved technology and weapons effectiveness have enhanced combat capability and actually reduced the requirement for larger numbers of aircraft to produce the required results.

Since the U.S. Air Force flies the great majority of missions on the UTTR, the following data is provided to illustrate the historical trend that promises no prospect of reversal in the near term and long term. (**Tab B, pp. 51, 56, 64, 66**)

	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
Total USAF Aircraft (AD, ANG, AFRC)	7,640	7,182	6,815	6,663	6,394	6,330	6,228
USAF Aircraft Flying Hours (Thousands)	2,790	2,584	2,317	2,253	2,181	2,205	2,154
USAF Personnel (Active Duty)	470,315	444,351	426,327	400,409	389,001	377,385	367,470
USAF Budget (constant \$ Billions)	97.155	90.683	83.707	81.773	79.100	77.680	79.796

¹ PFS has not used official Air Force projections of flight operations or force structure because projections concerning future years (beyond 2000) are contained in the Department of Defense Program Objective Memorandum (POM) which is not releasable due to security classification.

Federal Budget Categories to include total defense expenditures indicate that the other U.S. military services have experienced similar reductions as well. (*Tab B, pp. 58, 59*)

	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
Defense Budget (constant \$ Billions)	371.6	348.6	327.7	309.9	292.8	292.2	283.5
Defense Budget Percentage of GDP	4.9%	4.5%	4.1%	3.8%	3.5%	3.4%	3.2%

Therefore, the foregoing historical data concerning Air Force force structure and budgets is consistent with the FAA's projection that military air traffic will remain constant over the next 20 years. Indeed, if current trends continue into the future, the FAA's projection will be quite conservative. Therefore, it is reasonable to conclude that the military air crash impact probabilities provided by PFS in its August 13 submission will not increase over the license period of the PFSF.

Summary

Projected growth in civilian air traffic over the license period of the PFSF will increase the total air crash impact probability at the facility by less than two percent. There is projected to be no growth in military traffic, so such will have no effect on the impact probability. Thus, projected growth in air traffic will have no material effect on the crash impact probability that PFS provided to the NRC Staff in its August 13 submission.

NRC COMMENT 3: PFS should address the issue of apparently conflicting information from the Air Force concerning use of cruise missile Flight Termination System on the UTTR.

PFS RESPONSE: At the outset, PFS is aware of no Air Force statement that contradicts any Air Force statements made to PFS or any statement PFS has made to the NRC Staff or the Licensing Board. In performing its cruise missile hazard assessment, PFS has not relied on any information concerning the number of times flight termination systems (FTSs) have been used on the UTTR. PFS has only considered the number of cruise missile mishaps on the UTTR and the fact that no FTS on a weapon system used on the UTTR has ever failed.

The following is a discussion of the only potential Air Force contradiction that PFS could identify. In a July 20, 1999 e-mail communication from Capt. Mary Enges-Maas, USAF, to Connie Nakahara, State of Utah,² responding to State questions concerning cruise missiles on the UTTR, Capt. Enges-Maas stated that:

Approximately 12-15 crashes have occurred during the span of the cruise missile program. The usual cause of the crashes has been a missile anomaly. The U.S. Air Force has never had to self-destruct a missile using the remote control flight termination system (RCFTS).

In a July 22, 1999 e-mail communication from Capt. Enges-Maas to Ms. Nakahara,³ Capt. Enges-Maas stated that:

In addition to the 19 crashes [of Air Launched and Advanced Cruise Missiles], two other Conventional Air Launched Cruise Missiles have crashed.

.....

² Exhibit A to Supplemental Declaration of Major General John Matthews, U.S. Air Force (Retired) State of Utah's Response to PFS's Motion for Summary Disposition of Utah K, dated July 27, 1999.

³ Exhibit B to Supplemental Declaration of Gen. Matthews.

Only two CMs were terminated using the flight termination system in addition to the 21 mishaps above.

It is unclear whether the statements by Capt. Enges-Maas are contradictory or whether they are consistent in that they rely on the difference between 1) the termination of a missile flight through the use of an FTS generally and 2) the use of a remote controlled FTS. As PFS described in its June 30 submission (p. 27), and as the Air Force described in the accident report concerning the December 1997 cruise missile mishap on the UTTR, Accident Investigation Board Report, United States Air Force AGM-129 Advanced Cruise Missile (10 December 1997) (p. 7) (**Tab C**),⁴ the FTS on a missile that has the capability of leaving the range can be activated either automatically, when the FTS fails to receive a signal indicating that the missile is properly flying its course, or manually, by a range safety officer at Mission Control at Hill AFB or aboard the Airborne Range Instrumentation Aircraft on the UTTR. Thus, it is possible that Capt. Enges-Maas was referring to the manual (i.e., remote control) activation of the FTS in her July 20 e-mail and the automatic activation of the FTS in her July 22 e-mail. However, since PFS was neither a party nor privy to those communications, it is very difficult for PFS to specifically and accurately identify the cause of this potential contradiction.

In any event, neither of the statements contradicts the point made by PFS in its June 30 submission (p. 27), and earlier, that the Air Force has stated unequivocally, and without contradiction, that “[t]he UTTR has never experienced a[n] FTS failure.” June 30 submission, Attachment E. Therefore it remains reasonable to rely on the presence of FTSs on cruise missiles when assessing the potential hazard they pose to the PFSF.

⁴ Exhibit 3 to Declaration of James Cole, Jr., PFS Motion for Summary Disposition of Contention Utah K, dated June 7, 1999.

Tab A

**FAA LONG-RANGE
AEROSPACE FORECASTS
FISCAL YEARS
2015, 2020 AND 2025**

**OFFICE OF
AVIATION POLICY AND PLANS**

JUNE 1999

D. Total Aviation Activity

Total civil aircraft activity at towered and non-towered airports (based on projections for just under 4,000 public use airports in the Terminal Area Forecast database) is forecast to reach 142.8 million by the year 2025, an average annual growth rate of 0.8 percent over the activity level forecast for 2010 (129.4 million operations). This represents an average annual growth rate of 0.9 percent over the 116.1 million total aircraft operations recorded in 1998.

Commercial aircraft operations (the sum of air carrier and commuter/air taxi) at all U.S. airports, towered or non-towered, are projected to increase from 28.6 million in 1998 to 36.6 million in 2010, and to 47.6 million in 2025. These forecasts imply an average annual growth rate of 2.1 percent over the immediate forecast period, and 1.8 percent over the extended forecast period.

The number of general aviation operations at towered and non-towered airports is forecast to increase from 87.4 million in 1998 to 92.8 million in 2010 and to 99.2 million in 2025. The average annual growth rate for both the immediate and extended forecast periods is 0.5 percent. Much of the growth is the result of increased use of the turbine fleet for business/corporate related flying.

B. Instrument Operations

Instrument operations at combined FAA and contract towered airports are forecast to total 63.9 million in 2010 and 82.9 million in 2025, average annual growth rates of 2.1 and 1.8 percent, respectively, during the immediate and extended forecast periods. Most of the growth is expected to come from commercial activity, which is projected to grow 2.6 percent annually during the immediate forecast period and 2.2 percent annually during the extended forecast period. Air carrier instrument activity is forecast to grow 2.5 percent annually over the 27-year forecast period while commuter/air taxi activity is forecast to increase at a 2.2 percent average annual rate during the same time period.

General aviation activity is projected to increase at a relatively slower pace over the forecast period, averaging 1.7 percent through the immediate forecast period and 1.3 percent during extended forecast periods. Military activity is forecast to remain constant at the 3.4 million operations recorded in 1998 throughout the 27-year forecast period.

Commercial activity is expected to increase from 53.4 percent of total instrument activity at combined FAA and contract towers in 1998 to 60.1 percent by the year 2025.

C. ARTCC Aircraft Handled

The number of aircraft handled at FAA en route traffic control centers is forecast to reach 56.7 million in 2010 and 76.5 million in 2025, an average annual growth rate of 2.3 percent for the 1998-2010 time period and 2.0 percent for the 2010-2025 time period. Much of the growth occurs in the number of commercial aircraft handled, which increases by 2.7 and 2.3 percent, respectively, over the two forecast periods. The number of air carrier aircraft handled increases by an average annual rate of 2.6 percent over the 27-year forecast period--2.8 and 2.4 percent, respectively, over the immediate and extended time periods. The number of commuter/air taxi aircraft handled is forecast to increase by 2.3 percent annually during the immediate forecast period and 2.1 percent over the extended forecast period--2.2 percent over the entire 27-year period.

The number of general aviation aircraft handled at FAA en route centers increases at a slower rate over the two forecast periods, 1.9 percent annually over the immediate 12-year period and 1.5 percent over the extended 15-year period. The number of military aircraft handled is forecast to remain constant at the 4.2 million recorded in 1998 through 2025.

By the end of the 27-year forecast period, commercial activity is expected to account for 76.9 percent of the total center activity compared to 70.1 percent in 1998.

Tab B

May 1999/\$5

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE



1999 USAF Almanac

Air Force Personnel Strength

(As of Sept. 30, 1998)

Year	Strength	Year	Strength	Year	Strength
1907	3	1938	21,089	1969	862,062
1908	13	1939	23,455	1970	791,078
1909	27	1940	51,165	1971	755,107
1910	11	1941	152,125	1972	725,635
1911	23	1942	764,415	1973	690,999
1912	51	1943	2,197,114	1974	643,795
1913	114	1944	2,372,292	1975	612,551
1914	122	1945	2,282,259	1976	585,207
1915	208	1946	455,515	1977	570,479
1916	311	1947	305,827	1978	569,491
1917	1,218	1948	387,730	1979	559,450
1918	195,023	1949	419,347	1980	557,969
1919	25,603	1950	411,277	1981	570,302
1920	9,050	1951	788,381	1982	582,845
1921	11,649	1952	973,474	1983	592,044
1922	9,642	1953	977,593	1984	597,125
1923	9,441	1954	947,918	1985	601,515
1924	10,547	1955	959,946	1986	608,199
1925	9,670	1956	909,958	1987	607,035
1926	9,674	1957	919,835	1988	576,446
1927	10,078	1958	871,156	1989	570,880
1928	10,549	1959	840,028	1990	535,233
1929	12,131	1960	814,213	1991	510,432
1930	13,531	1961	820,490	1992	470,315
1931	14,780	1962	883,330	1993	444,351
1932	15,028	1963	868,644	1994	426,327
1933	15,099	1964	855,802	1995	400,409
1934	15,861	1965	823,633	1996	389,001
1935	16,247	1966	886,350	1997	377,385
1936	17,233	1967	897,426	1998	367,470
1937	19,147	1968	904,759	1999	370,882

1999 number is programmed.

Active Duty Force Demographics

(As of Sept. 30, 1998)

Grade	Total	Blacks	Women	Other Minorities
Officers				
General	274	8	7	8
Colonel	3,815	144	270	185
Lieutenant Colonel	10,418	717	1,304	184
Major	15,612	899	2,279	188
Captain	27,523	1,642	5,091	50
First Lieutenant	7,414	526	1,595	16
Second Lieutenant	6,836	475	1,425	6
Total	71,892	4,411	11,971	637
Enlisted				
Chief Master Sergeant of the Air Force	1			
Chief Master Sergeant	2,946	570	284	56
Senior Master Sergeant	5,896	1,066	682	168
Master Sergeant	29,606	6,044	3,281	1,241
Technical Sergeant	38,280	7,735	4,481	1,774
Staff Sergeant	73,461	13,402	10,720	4,066
Sergeant/Senior Airman	67,709	10,487	15,190	4,892
Airman First Class	44,600	7,660	11,633	5,150
Airman	17,698	3,222	4,551	1,901
Airman Basic	11,393	1,946	2,720	1,219
Total	291,590	52,132	53,542	20,467
Total personnel	363,482	56,543	65,513	21,104

Average ages of military personnel: Officers 35, Enlisted 28

Total does not include 3,988 cadets.

The Civilian Force

(As of Sept. 30, 1998)

General Schedule/Other		Wage Grade		Wage Grade Leader		Wage Grade Supervisory	
Grade	Force	Grade	Force	Grade	Force	Grade	Force
1	1	1	4	1	0	1	9
2	48	2	228	2	5	2	23
3	664	3	277	3	4	3	29
4	3,870	4	164	4	0	4	50
5	10,382	5	1,225	5	18	5	69
6	6,633	6	1,086	6	34	6	138
7	8,845	7	1,654	7	44	7	210
8	1,209	8	3,565	8	102	8	253
9	12,497	9	3,466	9	260	9	912
10	792	10	13,782	10	730	10	1,194
11	16,156	11	3,791	11	111	11	448
12	18,937	12	1,589	12	43	12	262
13	10,997	13	207	13	0	13	148
14	3,244	14	60	14	0	14	180
15	1,237	15	2	15	0	15	115
16	0	16	0	16	0	16	65
17	0	17	0	17	0	17	36
18	0	18	0	18	0	18	17
ST ^a	39	Total	31,100	Total	1,351	Total	4,158
SES ^b	159						
Other	250						
Total	95,960						

Air Force Civilian Personnel: Average Age and Length of Service

Average length of service (overall)	18 years
General schedule	17 years
Federal wage system	18 years
Average age	47 years

Includes active Title 5 civilians with permanent appointments, US citizens only.

Excludes Title 32 technicians, temporary employees, and foreign/local nationals.

^aScientific and Technical.

^bSenior Executive Service (Includes ES, IE, and IP).

Budgets

Terms Explained

Funding levels can be expressed in several ways. **Budget authority** is the value of new obligations that the federal government is authorized to incur. These include some obligations to be met in later years. Figures can also be expressed in **outlays** (actual expenditures, some of which are covered by amounts that were authorized in previous years).

Another difference concerns the value of money. When funding is in **current** or **then-year dollars**, no adjustment for inflation has taken place. This is the actual amount of dollars that has been or is to be spent, budgeted, or forecast. When funding is expressed in **constant dollars**, or **real dollars**, the effect of inflation has been factored out to make direct comparisons between budget years possible. A

specific year, often the present one, is chosen as a baseline for constant dollars.

Normally, Congress first authorizes payment, then appropriates it. **Authorization** is an act of Congress that establishes or continues a federal program or agency and sets forth guidelines to which it must adhere. **Appropriation** is an act of Congress that enables federal agencies to spend money for specific purposes.

Air Force Budget—A 10-Year Perspective

(Budget authority in current and constant \$ millions)

	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Current dollars										
Military personnel	\$21,777	\$22,755	\$21,381	\$20,141	\$18,168	\$19,602	\$19,309	\$19,186	\$19,111	\$19,451
Operations and maintenance	25,160	29,061	22,816	22,179	24,525	24,561	23,519	22,728	25,174	24,227
Procurement	30,276	24,041	23,249	21,803	17,716	16,529	15,558	14,247	15,258	17,494
RDT&E	13,507	12,207	12,867	12,979	12,021	11,787	12,427	14,017	14,265	13,683
Military construction	1,453	1,117	1,200	1,053	1,554	816	1,285	1,567	1,537	1,372
Family housing	870	888	1,112	1,212	923	1,106	1,124	1,135	1,114	1,086
Rev. and mgmt. funds	121	1,672	n/a	n/a	n/a	n/a	n/a	790	234	31
Trust and receipts	-274	-485	-286	-221	-332	-470	-231	-453	-409	-439
Total	92,890	91,257	82,340	79,146	74,575	73,933	72,992	73,218	76,284	76,905
Constant FY00 dollars										
Military personnel	29,829	29,754	27,153	24,498	21,567	22,719	21,875	21,142	20,447	20,193
Operations and maintenance	31,603	32,813	26,778	25,308	27,397	27,181	25,450	24,000	25,815	24,455
Procurement	36,058	27,819	26,276	24,147	19,264	17,662	16,380	14,824	15,710	17,775
RDT&E	16,399	14,269	14,663	14,468	13,153	12,664	13,105	14,561	14,679	13,906
Military construction	1,724	1,289	1,354	1,166	1,688	871	1,354	1,634	1,585	1,394
Family housing	1,050	1,025	1,259	1,342	1,001	1,180	1,177	1,173	1,139	1,100
Rev. and mgmt. funds	148	1,961	n/a	n/a	n/a	n/a	n/a	814	240	31
Trust and receipts	-335	-569	-326	-246	-362	-503	-242	-467	-419	-446
Total	116,476	108,361	97,155	90,683	83,707	81,773	79,100	77,680	79,196	74,408
Percentage real growth										
Military personnel	-2.0	-0.3	-8.7	-9.8	-12.0	5.3	-3.7	-3.4	-3.3	-1.2
Operations and maintenance	-1.9	4.1	-18.4	-5.5	8.3	-0.8	-6.4	-5.7	7.6	-5.3
Procurement	-5.6	-22.9	-5.5	-8.1	-20.2	-8.3	-7.3	-9.5	6.0	13.1
RDT&E	-11.6	-12.9	2.8	-1.3	-9.1	-3.7	3.5	11.1	0.8	-5.3
Military construction	-2.9	-25.2	5.0	-13.9	44.8	-48.4	55.5	20.7	-3.0	-12.1
Family housing	-8.9	-2.3	22.8	6.6	-25.4	17.9	-0.3	-0.3	-2.9	-3.4
Total	-4.6	-7.0	-10.3	-6.7	-7.7	-2.3	-3.3	-1.8	2.0	-1.0

Air Force Major Force Programs

(Total Obligation Authority in FY00 constant \$ billions)

	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Forces										
Strategic Forces	\$15.6	\$14.6	\$12.2	\$9.7	\$6.2	\$5.1	\$5.1	\$3.9	\$4.4	\$4.1
General-Purpose Forces	25.6	24.4	20.4	18.4	17.6	16.9	16.9	16.6	16.8	16.5
Airlift Forces	6.8	5.9	7.0	8.1	8.7	9.1	8.7	8.6	9.0	9.8
Guard and Reserve Forces	7.4	6.5	6.9	7.2	7.3	7.5	7.2	7.1	7.4	7.5
Special Operations Forces	1.4	0.3	0.3	0.4	0.4	0.4	0.5	0.4	0.4	0.4
Total	56.8	51.7	46.8	43.8	40.2	39.0	38.4	36.6	38.0	38.3
Support										
Intelligence & Communications	\$21.6	\$20.1	\$21.5	\$21.2	\$20.6	\$18.0	\$18.4	\$18.2	\$19.0	\$19.0
Research & Development	10.9	9.4	9.0	8.4	7.5	8.4	8.5	8.1	8.1	7.2
Central Supply & Maintenance	12.2	10.6	7.2	6.5	4.5	4.5	4.2	4.0	4.0	4.2
Training, Medical, & General Personnel	12.2	13.9	9.6	9.4	8.7	9.0	8.9	8.4	8.4	8.5
Administration & Other	1.6	1.6	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.4
Total	58.5	55.6	48.8	47.0	42.8	41.3	41.5	40.2	41.0	40.3

Explanatory Note

Data for 1962-98 are historical. Data for 1999-2000 are projections. These four tables are based on "The Economic and Budget Outlook: Fiscal Years 2000-09," published by the Congressional Budget Office, January 1999. (Constant dollar figures are derived.)

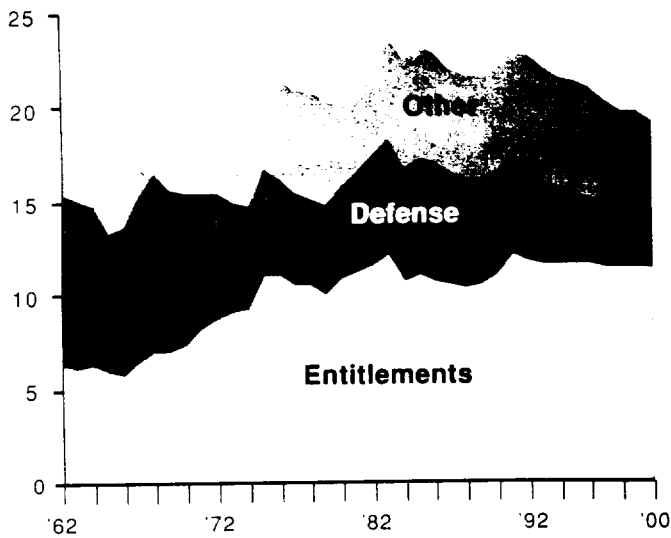
Federal Budget Categories Current \$ billions

Year	Total Outlays	Deficit	Entitlements	Defense
1962	\$106.8	\$5.9	\$34.7	\$52.6
1963	111.3	4.0	36.2	53.7
1964	118.5	6.5	38.9	55.0
1965	118.2	1.6	39.7	51.0
1966	134.5	3.1	43.4	59.0
1967	157.5	12.6	50.9	72.0
1968	178.1	27.7	59.7	82.2
1969	183.6	0.5	64.7	82.7
1970	195.6	8.7	72.6	81.9
1971	210.2	26.1	86.9	79.0
1972	230.7	26.4	100.9	79.3
1973	245.7	15.4	116.1	77.1
1974	269.4	8.0	131.0	80.7
1975	332.3	55.3	169.6	87.6
1976	371.8	70.5	189.4	89.9
1977	409.2	49.8	204.0	97.5
1978	458.7	54.9	227.7	104.6
1979	504.0	38.7	247.3	116.8
1980	590.9	72.7	291.5	134.6
1981	678.2	74.0	339.6	158.0
1982	745.8	120.1	370.9	185.9
1983	808.4	208.0	410.7	209.9
1984	851.9	185.7	405.8	228.0
1985	946.4	221.7	448.4	253.1
1986	990.5	238.0	462.0	273.8
1987	1,004.1	169.3	474.4	282.5
1988	1,064.5	194.0	505.3	290.9
1989	1,143.7	205.2	549.6	304.0
1990	1,253.2	277.8	627.3	300.1
1991	1,324.4	321.6	702.6	319.7
1992	1,381.7	340.5	716.6	302.6
1993	1,409.4	300.4	736.8	292.4
1994	1,461.7	258.8	784.0	282.3
1995	1,515.7	226.3	818.2	273.6
1996	1,560.5	174.0	857.5	266.0
1997	1,601.2	103.3	896.3	271.9
1998	1,651.4	29.2	938.6	269.6
1999	1,707.0	19.0	982.0	276.7
2000	1,739.0	7.0	1,028.0	274.1

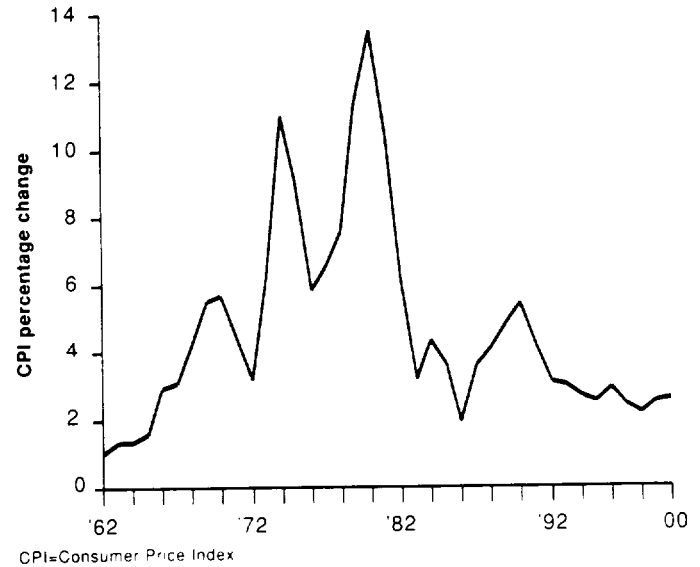
Federal Budget Categories Constant FY00 \$ billions

Year	Total Outlays	Deficit	Entitlements	Defense
1962	609.3	41.3	198.0	300.1
1963	626.9	27.7	203.9	302.4
1964	658.8	44.4	216.3	305.8
1965	646.8	10.8	217.2	279.1
1966	715.3	20.2	230.8	313.8
1967	812.4	79.8	262.5	371.4
1968	881.6	168.4	295.5	406.9
1969	861.5	2.9	303.6	388.0
1970	868.3	47.4	322.3	363.6
1971	893.8	136.3	369.5	335.9
1972	950.5	133.6	415.7	326.7
1973	953.2	73.4	450.4	299.1
1974	941.6	34.3	457.9	282.1
1975	1,064.6	217.6	543.3	280.6
1976	1,125.8	262.2	573.5	272.2
1977	1,163.4	173.9	580.0	277.2
1978	1,212.1	178.2	601.7	276.4
1979	1,196.6	112.8	587.1	277.3
1980	1,236.0	186.8	609.7	281.5
1981	1,286.1	172.3	644.0	299.6
1982	1,331.8	263.4	662.3	332.0
1983	1,398.8	442.0	710.6	363.2
1984	1,413.3	378.3	673.2	378.2
1985	1,515.5	436.0	718.0	405.3
1986	1,556.5	459.3	726.0	430.3
1987	1,523.1	315.4	719.6	428.5
1988	1,551.1	347.2	736.3	423.9
1989	1,590.2	350.4	764.2	422.7
1990	1,653.2	450.0	827.5	395.9
1991	1,676.7	500.0	889.5	404.7
1992	1,696.6	513.5	879.9	371.6
1993	1,680.2	439.8	878.4	348.6
1994	1,696.8	368.9	910.1	327.7
1995	1,716.5	314.7	926.6	309.9
1996	1,717.5	235.2	943.7	292.8
1997	1,720.9	136.3	963.3	292.2
1998	1,736.7	37.7	987.1	283.5
1999	1,751.4	23.9	1,007.5	283.9
2000	1,739.0	7.0	1,028.0	274.1

Federal Budget Outlay Categories Percentages of GDP



Inflation Rates



Year	Total Outlays	Deficit	Entitlements	Defense
1962	18.8	1.0	6.1	9.3
1963	18.6	0.7	6.0	9.0
1964	18.5	1.0	6.1	8.6
1965	17.2	0.2	5.8	7.4
1966	17.8	0.4	5.7	7.8
1967	19.4	1.6	6.3	8.9
1968	20.5	3.2	6.9	9.4
1969	19.4	0.1	6.8	8.7
1970	19.4	0.9	7.2	8.1
1971	19.5	2.4	8.1	7.3
1972	19.6	2.2	8.6	6.7
1973	18.8	1.2	8.9	5.9
1974	18.7	0.6	9.1	5.6
1975	21.4	3.6	10.9	5.6
1976	21.5	4.1	10.9	5.2
1977	20.8	2.5	10.4	4.9
1978	20.7	2.5	10.3	4.7
1979	20.2	1.6	9.9	4.7
1980	21.7	2.7	10.7	5.0
1981	22.3	2.4	11.1	5.2
1982	23.2	3.7	11.5	5.8
1983	23.6	6.1	12.0	6.1
1984	22.3	4.9	10.6	6.0
1985	23.0	5.4	10.9	6.2
1986	22.7	5.4	10.6	6.3
1987	21.8	3.7	10.3	6.1
1988	21.5	3.9	10.2	5.9
1989	21.4	3.8	10.3	5.7
1990	22.1	4.9	11.0	5.3
1991	22.6	5.5	12.0	5.5
1992	22.5	5.5	11.7	4.9
1993	21.8	4.6	11.4	4.5
1994	21.3	3.8	11.4	4.1
1995	21.1	3.1	11.4	3.8
1996	20.7	2.3	11.4	3.5
1997	20.1	1.3	11.2	3.4
1998	19.6	0.3	11.2	3.2
1999	19.5	0.2	11.2	3.1
2000	19.1	0.1	11.3	3.0

Year % change

1962	1.0
1963	1.3
1964	1.3
1965	1.6
1966	2.9
1967	3.1
1968	4.2
1969	5.5
1970	5.7
1971	4.4
1972	3.2
1973	6.2
1974	11.0
1975	9.1
1976	5.8
1977	6.5
1978	7.6
1979	11.3
1980	13.5
1981	10.3
1982	6.2
1983	3.2
1984	4.3
1985	3.6
1986	1.9
1987	3.6
1988	4.1
1989	4.8
1990	5.4
1991	4.2
1992	3.1
1993	3.0
1994	2.7
1995	2.5
1996	2.9
1997	2.4
1998	2.2
1999	2.5
2000	2.6

Annual Pay for Federal Civilians

(Effective Jan. 1, 1999)

General Schedule

Grade	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
GS-1	\$13,362	\$13,807	\$14,252	\$14,694	\$15,140	\$15,401	\$15,838	\$16,281	\$16,299	\$16,718
GS-2	15,023	15,380	15,878	16,299	16,482	16,967	17,452	17,937	18,422	18,907
GS-3	16,392	16,938	17,484	18,030	18,576	19,122	19,668	20,214	20,760	21,306
GS-4	18,401	19,014	19,627	20,240	20,853	21,466	22,079	22,692	23,305	23,918
GS-5	20,588	21,274	21,960	22,646	23,332	24,018	24,704	25,390	26,076	26,762
GS-6	22,948	23,713	24,478	25,243	26,008	26,773	27,538	28,303	29,068	29,833
GS-7	25,501	26,351	27,201	28,051	28,901	29,751	30,601	31,451	32,301	33,151
GS-8	28,242	29,183	30,124	31,065	32,006	32,947	33,888	34,829	35,770	36,711
GS-9	31,195	32,235	33,275	34,315	35,355	36,395	37,435	38,475	39,515	40,555
GS-10	34,353	35,498	36,643	37,788	38,933	40,078	41,223	42,368	43,513	44,658
GS-11	37,744	39,002	40,260	41,518	42,776	44,034	45,292	46,550	47,808	49,066
GS-12	45,236	46,744	48,252	49,760	51,268	52,776	54,284	55,792	57,300	58,808
GS-13	53,793	55,586	57,379	59,172	60,965	62,758	64,551	66,344	68,137	69,930
GS-14	63,567	65,686	67,805	69,924	72,043	74,162	76,281	78,400	80,519	82,638
GS-15	74,773	77,265	79,757	82,249	84,741	87,233	89,725	92,217	94,709	97,201

Senior Executive Service

ES-1	ES-2	ES-3	ES-4	ES-5	ES-6
\$102,300	\$107,100	\$112,000	\$118,000	\$118,400	\$118,400

NOTE: Since January 1994, locality-based comparability payments have been applied to General Schedule (GS) and Senior Executive Service (ES) positions in the continental United States. In other words, pay is higher in areas of the US where nonfederal salaries are higher. Because there are 30 locality pay areas recognized by the Office of Personnel Management, there are in effect 30 different GS and ES pay schedules based on the schedule above. Locality pay adjustments do not apply to employees already receiving special salary rates that exceed the locality rate nor to overseas employees.

Housing Allowance

(Effective Jan. 1, 1999)

Pay Grade	With Dependents	Without Dependents
O-10	\$1,081.20	\$878.40
O-9	1,081.20	878.40
O-8	1,081.20	878.40
O-7	1,081.20	878.40
O-6	973.50	805.80
O-5	938.40	776.10
O-4	827.10	719.10
O-3	684.30	576.60
O-2	584.40	457.20
O-1	522.60	385.20
O-3E	735.30	622.50
O-2E	663.60	528.90
O-1E	613.20	455.10
E-9	702.60	533.10
E-8	647.70	442.50
E-7	601.50	417.90
E-6	555.60	378.30
E-5	499.80	348.90
E-4	434.40	303.60
E-3	404.40	297.60
E-2	385.20	241.80
E-1	385.20	215.70

Subsistence Allowance

(Effective Jan. 1, 1999)

Cash/In-Kind		
Officers		157.26/month
Enlisted Members		
When on leave or authorized to mess separately	E-1 <4 Months	All Other Enlisted
	\$6.93/day	\$7.50/day
When rations in-kind are not available	\$7.81/day	\$8.46/day
	\$10.36/day	\$11.21/day
When assigned to duty under emergency conditions where no US mess facilities are available		

Total Number of USAF Aircraft In Service Over Time

(As of Sept. 30, 1998)

Type of aircraft	FY92	FY93	FY94	FY95	FY96	FY97	FY98
Bomber	248	225	178	183	185	177	179
Tanker	478	391	326	325	314	310	317
Fighter/interceptor/attack	2,000	1,848	1,781	1,750	1,637	1,631	1,613
Reconnaissance/electronic warfare	238	241	225	318	257	252	211
Cargo/transport	794	749	733	690	654	612	610
Search & rescue (fixed wing)	56	84	34	12	9	9	9
Helicopter (includes rescue)	206	203	189	123	174	178	165
Trainer	1,313	1,150	1,188	1,205	1,193	1,234	1,247
Utility/observation/other	89	95	107	104	98	98	96
Total active duty	5,422	4,986	4,761	4,710	4,521	4,501	4,447
Air National Guard	1,694	1,653	1,586	1,461	1,426	1,375	1,351
AFRC	524	543	468	462	447	454	430
Total active duty, ANG, and AFRC	7,640	7,182	6,815	6,633	6,394	6,330	6,228
Total aircraft, including foreign-government-owned	7,733	7,276	7,028	6,725	6,476	6,412	6,327

Age of the Active Duty Fleet

(As of Sept. 30, 1998)

	Age in Years									Average
	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	24+	
A/OA-10					13	177	27			16.8
B-1				58	15					11.3
B-2	7	10	3	1						4.1
B-52									85	36.8
C-5				43	7				31	16.8
C-9								3	20	27.5
KC-10			1	11	30	17				13.7
C-12				4	8		1	21		19
C-17	20	19	4							3.1
C-18 ^a		2				3				11.6
C-20	1	1		8	2	1				10.9
C-21					76					13.7
C-25			2							7.9
C-27		2	5							6.4
C-32	2									0.3
C-130 ^b		16	17	13	7			49	198	26
C-135 ^b									296	36.7
C-137 ^b			1		2				2	19.6
C-141 ^b									122	31.9
E-3					3	8	13	8		18.8
E-4								2	2	24.3
E-8	4		1							2.6
F-15		36	118	118	100	140	100	3	1	12.9
F-16	22	192	308	165	88	8	9			8.1
F-22	2									0.7
F-117 ^c			56							7.4
G-3			3							7.6
G-4		4	1	1		3	5			13
G-7				4	1	4				13
G-9				4						11.6
G-10		1								3.6
G-11		2								3.2
H-1									63	27.7
H-53			1	5				1	39	25.9
H-60		5	30	11	2	8				9.5
RQ-1	4									1.2
SR-71									2	32.2
T-1	57	102	21							3.9
T-3	14	96								3.6
T-37									418	35.2
T-38									509	31.5
T-39									3	37.6
T-41									3	28.5
T-43									11	24.5
U-2			1	9	13	8			4	15
UV-18	1							2		14.5
Total	134	488	573	455	367	377	155	89	1809	19.7
Percent^d	3%	11%	13%	10%	8%	8%	3%	2%	41%	

^aIncludes EC-18. ^bIncludes all types. ^cIncludes YF-117. ^dPercentages are rounded.

USAF Aircraft Flying Hours

(In thousands, as of Sept. 30, 1998)

	FY92	FY93	FY94	FY95	FY96	FY97	FY98
Active duty	2,195	1,993	1,750	1,709	1,657	1,680	1,644
ANG	441	442	412	403	380	375	361
AFRC	154	149	155	141	144	150	149
Total	2,790	2,584	2,317	2,253	2,181	2,205	2,154

USAF Squadrons by Mission Type

(As of Sept. 30, 1998)

	FY94	FY95	FY96	FY97	FY98
Active forces					
Bomber	12	10	10	10	10
Air refueling	25	24	23	23	25
Strategic command & control	0	1	1	1	2
Fighter	53	54	54	54	47
Reconnaissance	0	4	4	4	0
Electronic warfare	4	3	3	3	3
Special Operations Forces	16	15	16	16	13
Ground theater air control	5	5	5	5	8
Airborne theater air control	7	7	7	9	8
Weather	0	0	1	0	0
Rescue	6	6	7	7	7
Theater airlift	11	12	12	13	11
Long-range airlift	16	15	15	17	20
Special mission	2	2	2	2	2
Aeromedical airlift	3	3	3	3	3
ICBM	19	14	14	14	14
Space operations	6	9	10	10	10
Space communications	3	3	2	1	1
Space warning	10	11	9	8	8
Space surveillance	7	9	7	6	6
Space launch	5	5	5	5	5
Range	2	2	2	2	2
Total	212	214	212	213	205
Reserve forces					
ANG Selected Reserve	89	89	87	88	88
AFRC	59	48	48	60	62
Space operations	1	1	1	1	3
Total	149	138	136	149	153
Grand total	361	352	348	362	358

Aircraft per Active Duty USAF Squadron

(As of Sept. 30, 1998)

Aircraft	Number
A/OA-10	2, 4, 6, 9, 12, 17
B-1B	2, 6, 12, 16
B-2	8
B-52	1, 12
C-5	6, 16
C-9A	1, 3, 4, 11
C-17	7, 12
C-130	8, 10, 14, 16, 18, 20
AC-130	3, 6, 10
EC-130H	5
HC-130P/N	9
MC-130	4, 5, 7, 8, 10
MH-53J	5, 20
MH-60G	3, 8
KC-10A	12, 15
KC-135	6, 9, 10, 11, 12, 15, 24
C-141B	6, 9, 16
E-3	2, 25
F-15	4, 6, 8, 18, 67
F-15E	1, 2, 3, 5, 18, 24
F-16	7, 8, 9, 18, 24, 155
F-117A	1, 9, 18
HH-60G	1, 2, 4, 6, 7, 8

For some types of aircraft, squadrons vary in size, as shown here.

Air National Guard Air Defense Unit Fin Flashes

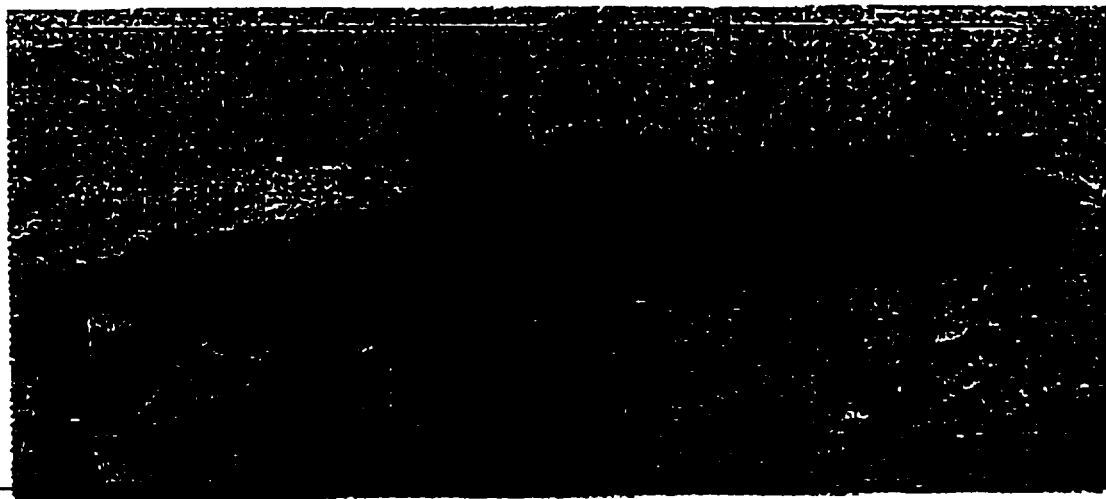
Description	Aircraft	Unit and Location
Minuteman over Massachusetts	F-15A/B	102d FW, Otis ANGB, Mass.
Red stripe with "Happy Hooligans" logo	F-16A/B	119th FW, Hector IAP, N.D.
Dark gray bison's skull against prairie/mountain profile	F-16A/B	120th FW, Great Falls IAP, Mont. ^a
Subdued hawk with banner in talons	F-15A/B	123d FS (142d FW), Portland IAP, Ore.
Gray lightning bolt	F-15A/B	125th FW, Jacksonville IAP, Fla.
Black falcon with talons extended and "California" logo	F-16C/D	144th FW, Fresno Air Terminal, Calif.
Texas star on subdued jagged stripes with "Houston" logo	F-16C/D	147th FW, Ellington Field, Texas ^a
Stars of Little Dipper constellation and "Duluth" logo	F-16A/B	148th FW, Duluth IAP, Minn.
Black falcon with "Vermont" on subdued stripe	F-16C/D	158th FW, Burlington IAP, Vt. ^a
Stylized "Jersey Devil" and "New Jersey" logo	F-16C/D	177th FW, Atlantic City IAP, N.J. ^a
Subdued eagle and "Oregon" logo	F-15A/B	114th FS (173d FW), Klamath Falls IAP, Ore. ^a
Starburst state flag and "Arizona" logo	F-16A/B	162d FW, Tucson IAP, Ariz. ^a

^aGeneral-purpose units no longer Air Defense only
^bANG training units

Tab C

ACCIDENT INVESTIGATION BOARD REPORT

UNITED STATES AIR FORCE AGM-129
Advanced Cruise Missile
Serial Number 90-0061



10 December 1997
Dugway Proving Ground, Utah

Volume I of III

Key capabilities of the Utah Test and Training Range used to support cruise missile tests are optical tracking, radar tracking, radio and telemetry relay, and ground stations capable of transmitting either remote control or flight termination instructions to the missile.³⁰ Test functions are remotely monitored and operated from the test Mission Control Center at Hill Air Force Base, Utah.³¹ 388th Range Squadron cruise missile testing procedures developed by Air Force Flight Test Center require operational hazard analyses and formal safety reviews of all test programs as well as safety reviews of particular test missions.³²

(4). Missile Termination/Command and Control.

(a). Termination. Before a bomber launches a test cruise missile, the Mission Control Center verifies that the missile's remote control and flight termination systems are working properly.³³ At all times throughout the flight the cruise missile flight termination system must detect a signal that in effect permits the missile to keep flying.³⁴ If the missile does not detect the signal for a preset time, the flight termination system activates, causing the missile to tumble and crash.³⁵ This arrangement is functionally equivalent to a dead-man switch. The missile transmits measurements which confirm it is receiving the authorizing signal (and the strength of that signal) to Mission Control throughout flight.³⁶ Safety officers can also activate the flight termination system in case of need at any time.³⁷ The Range Safety Officer at Mission Control and the Airborne Range Instrumentation Aircraft are both capable of terminating missile flight almost instantly.³⁸

(b). Command and Control. The missile also relays any instructions its remote control system receives at the same time it carries out those instructions.³⁹ Mission Control at Hill Air Force

³⁰ O.4.B-2 -3, O.4.F-38 -40, O.1.D-116

³¹ O.4.B-2 -3, O.4.F-38 -39

³² O.1.B-17 ff, O.1.P-306, -308, -314, -318

³³ O.1.B-22 -24, O.1.C-51, -60, -68, -69, O.1.D-111, O.2.M-74 -75, O.2.N-91 -93

³⁴ O.1.C-48 -57, O.1.B-28, O.2.N-89

³⁵ O.1.B-28, O.1.C-49, -86

³⁶ O.1.B-23 -24, O.1.C-51, -60, -68, -69

³⁷ O.1.B-28, O.1.C-61, O.1.P-318, O.2.N-89

³⁸ O.1.B-23 -28, O.1.P-320 -321

³⁹ O.1.B-22, O.1.C-60, -68, -75