Constraints to Increased U.S. Defense Spending

Douglas Meade

Background

During the last 12 years, much of the debate in defense policy circles has centered around downsizing, conversion, base closure impacts and retraining former defense personnel for the civilian economy. Although there has been some concern about the shrinking defense industrial base resulting from declining spending, most analysts discount this problem, as there appears to be sufficient production capacity for flat or slightly rising defense spending as currently projected by the administration.[1]

The current administration readiness policy as stated in the Bottom Up Review (BUR) and later documents is to be able to fight a full-fledged conflict in at least two areas of the world simultaneously, such as Iraq and Kosovo. However, the recent bombing campaign in Kosovo has shown dramatically how fast resources can be consumed in a relatively minor conflict. If two full scale conflicts were to erupt simultaneously, and last for several years, the required commitments of manpower, ships, aircraft, tanks, vehicles and ammunition could be much larger than the U.S. has experienced at any time since WWII.

This paper analyzes the likely constraints to such a large increase in mobilization of manpower and procurement such as would be necessary in in the face of two major conflicts. This would not necessarily be on the scale of a full world war, but still larger than the Korean or Vietnamese conflicts.

The Inforum LIFT and Iliad models are used with DEPPS[2] to determine the requirements needed for this mobilization in terms of production, capital requirements and labor by occupational category. I will examine the size of the changes required to determine what might be the bottlenecks for such spending, both in terms of capital investment as well as requirements for skilled labor. I also investigate the import requirements for such increased spending, and try to identify any production that might be at risk from a curtailment of imports, such as would occur from a closing of sea lanes.

The Model Structure

The starting point for the simulation exercise is to specify the future path of defense spending that would likely be necessary to fight two major conflicts such as this. This requires arriving at a figure for total spending, as well as spending by major category or program title. Next, the defense translator[3] is used to convert assumptions by major category of spending into purchases by industry for the LIFT and Iliad interindustry models. Then LIFT is run, using the industry defense spending assumptions as well as certain various aggregate assumptions. LIFT is a full macro model as well as industry model, with industry detail of 85 sectors. In general, LIFT builds up macroeconomic results from industry detail. After a satisfactory simulation with the LIFT model has been developed, the Iliad model is run, using results from LIFT and detailed defense spending assumptions. The Iliad model works at the level of 320 industries, and converts the LIFT simulation to a finer level of detail. Finally, the IDEPPS, RDEPPS and LDEPPS models are run, using results from LIFT, Iliad and the translator. IDEPPS calculates defense spending impacts by industry at the 320 sector level, both from total spending, and by major title, such as military personnel, operations and maintenance, and aircraft procurement. RDEPPS calculates impacts of defense spending by state, at the level of 85 sectors, by major title. LDEPPS calculates defense and defense related employment, as well as total employment, for 100 occupational categories.

Assumptions for the Scenarios

In the rest of this paper, the current administration projection, as published in DEPPS, will be referred to as the base case. The higher spending scenario is the “Two Conflicts” scenario, and will be referred to as the alternate, or “high” spending case. The scenario assumes that U.S. active military personnel would need to be increased from 1.3 to 4.8 million, and that non pay spending would more than double from its current level. Total defense spending, including military pay, would reach a peak of 600 billion constant dollars, and about 8% of GDP. I assume that the conflicts last for 5 years, from 2001 to 2005, with expenditures reaching their peak by 2003 and remaining at that level until 2005.

Figures 1 and 2 put the assumed spending level into historical perspective. Figure 1 shows the level of defense spending from 1939 to the present, in 2000 constant dollars[4]. From 1998 forward the bottom line represents the current administration projection of spending. Figure 2 shows defense spending measured as a share of GDP, calculated in current prices. Tables 1 and 2 compare the base projection with the alternate projection, by major category of spending. Total spending is shown on the bottom line. These figures are also in 2000 constant dollars.

The two scenarios start with the same level and composition of spending in 2000. The base projection is for flat and then slightly rising defense expenditures, although the defense share of GDP continues to fall. In the alternate case, total expenditures rise to 600 billion in constant prices, a little over 8% of GDP in current prices. The increase is not immediate, but there is a transition period of two years (2001-2), with constant price expenditures reaching their plateau by 2003, and remaining at that level in constant prices until 2005, the end of the simulation. By comparison, peak spending in WWII was about a trillion dollars, the Vietnam and Reagan buildups reached about 400 million, and spending in the Korean war reached about 350 billion, all measured in 2000 constant dollars.

Active duty military personnel are assumed to remain at just below 1.4 million in the base case, but rise to 4.8 million in the alternate case. To put this in historical context, active duty military peaked in WWII in 1945 at about 12 million, the peak in the Vietnam was was 3.5 million and in the Korean war it was 3.6 million. The Reagan buildup was more of a procurement buildup than a manpower buildup, and active duty military peaked in 1987 at slightly over 2.2 million.

Projecting the distribution of the spending by program title depends upon assumptions about what kind of war will be fought, and what kinds of damage and losses of equipment to expect. The largest component of spending is military personnel, and this is assumed to triple from the base case, to 225 billion, due to the tripling of active duty military. The next largest component is total procurement, which is expected to rise to 165 billion. In the base case, procurement rises slightly to 61.8 billion from the current level of 48.6 billion. In the last year of WWII, total procurement stood at almost 400 billion. The highest level reached since then has been 110 million, which was the peak level of spending in the Korean war (1953), the Vietnam war (1969) and the Reagan buildup (1987). This assumption requires than expenditures on total procurement increase by more than three times the projected level for 2000. However, note that this level for 2000 is a historical low.[5] Within the procurement category, we have assumed significant increases in all categories. The largest categories of spending are aircraft (70 billion), ships (30 billion), other procurement (30 billion) and missiles (15 billion), but ammunition shows the greatest percentage increase. We assume that RDT&E only grows slightly from its current level, and military construction and family housing grow to a little more than twice their current level.

In developing the macroeconomic scenario, there are a number of important issues to confront. Unlike the case of WWII, where the increase of spending and personnel took place at the end of a depression, the defense spending increase in this scenario starts in an environment of low unemployment and tight capacity utilization. By 2003, about 3 million people move out of the civilian labor force into the military, exacerbating labor shortages in domestic industry. In addition, federal defense spending is making huge additional demands on the economy. In this tight economy, we can expect to see personal consumption and business investment get crowded out by the additional defense spending, and this is indeed what the LIFT model tends to do own its own, with no further assumptions. However, the model tends to make a tighter economy with higher GDP, and lower unemployment. To keep overall spending at roughly the same level as in the base case, I assume that half of the extra cost of defense is paid for by a temporary tax increase, and the other half is financed by an increase of personal savings. In WWII personal savings also increased, as consumers were encouraged to buy savings bonds for the war effort. The auxiliary assumptions push personal consumption down to the point where total real GDP is almost the same in the base and the alternate case.

Macroeconomic Results

Table 3 shows a summary of macroeconomic assumptions and results from the Inforum LIFT model. For each item of the table, the first line shows the value for the base case, and the second line shows the difference between the alternate and the base case. The last column shows average values for the period 2003 to 2005, when the defense spending is at its peak. Constant price results are presented in chain-weighted 1992 dollars.

The first half of the table summarizes GDP and its components. The line for federal defense spending is near the middle of the table, and is the only component of GDP that was changed exogenously. Personal consumption expenditures were also affected indirectly by exogenous assumptions, namely an increase in the tax rate, and an increase in the savings rate. Over the interval 2003 to 2005, the average share of federal taxes as a share of personal income was raised by 1.7 points, or almost 15%. This results in smaller disposable income. The savings rate over this interval more than doubled, although the savings rates projected in the base scenario are quite low by historical standards. The savings rate in the alternate case is 4.9%, which is still lower than in most of the 1970 to 1990 period. The net result is that personal consumption is sharply reduced, by an average of 262 billion in the 2003-5 interval. Since the projected population for this period is about 285 million, this implies that per capita consumption falls by nearly $1000. Investment in residential structures also declines, mainly due to the drop in disposable income. Equipment investment declines, although there are significant increases in investment required in certain industries impacted by defense spending, as we shall see below.

In constrast to the Johnson administration during the war with Vietnam, we do not try to get more “guns and butter” at the same time, but reduce domestic consumption to free up capacity for defense needs. However, the economy is still slightly tighter in the alternate case, with unemployment lower by about 0.5% on average, and with a slight increase in the GNP deflator. The federal deficit is significantly higher. Although we have assumed a fairly large tax increase, revenue is reduced somewhat by the smaller private economy. An effect of the larger deficit is a sharp increase in both long- and short-term interest rates, as shown at the bottom of table 3.

Required Shifts in Industry Output and Employment

The Iliad model translates the 85 sector projections from LIFT to a more detailed 320 sector level. The impacts of the increase in defense spending on output by industry are highlighted in table 4, which shows the top 20 industries, ranked by the percentage increase in industry output from the base. Note that the output changes are not caused only by direct defense purchases, but also by indirect purchases. For example, industries such as Electronic components and Nonferrous casings and forgings, are used as inputs to produce other defense goods, such as aircraft, and search and navigation equipment. Other industries, such as Machine tools and Metalworking machinery, comprise part of the capital investment in tools and machinery necessary to expand capacity for increased production.

The top 6 industries in this list must expand output by over 50% in a fairly short time period. The top 3 industries must expand output more than 150%. These are likely to be the industries that may be expected to be bottlenecks to such an expansion of defense spending. To expand output to this degree, they must draw labor from other sectors of the economy, and make new investments in equipment and plant, which will take time.

Table 5 gives an indication of the degree of employment shifts necessary to expand defense production. In this table, the top 20 industries have been chosen on the basis of the absolute size of the employment increase necessary to support the increased defense demands. The top 20 industries would require a shift of 750 thousand jobs. The top 3 industries, Ship building, Engineering and architectural services, and Aircraft and missile parts, would require nearly 300 thousand additional jobs. Enticing this number of people to move into these sectors in a tight economy might be expensive, and I have made no attempt to guess at the wage increases necessary to provide incentives to change jobs. As we will see below, finding the right types of skilled labor may also be difficult in certain industries.

Capacity Expansion and Investment

One of the factors that may limit the increase of defense production is the speed at which plant and equipment capital can be added for those industries that require large increases in output. In the LIFT model, investment by industry responds to output increases with a lag of one to three years. Both the LIFT and Iliad models use a capital flow matrix to translate equipment investment purchases by buyer (by 55 industries) to equipment supplied by selling industries (85 industries in LIFT, 320 in Iliad). It is via this linkage that the extra demands are generated for such industries as machine tools and metalworking equipment.

By analyzing capital output ratios, we can determine how much extra capital stock is needed to support the increased output for the important defense industries. Tables 6 and 7 show the long-run optimal capital stock for the base case and the alternate case, for the Aerospace and Shipbuilding industries. The first 10 lines of each table show the industries in Iliad comprising the largest part of the capital stock for each industry, and the bottom line shows the total for that industry.[6] The first column of each table shows the coefficient in the capital flow table. For example, the first coefficient of .142 in table 6 means that about 14% of the investment in the Aerospace industry is for computers. The next two columns show the optimal capital stock for the base case and the alternate case. These are formed by multiplying the capital flow table coefficient by the total optimal stock. The fourth column shows the additional investment needed in the alternate case to bring capital stock up to its desired level. The fifth column shows the base case investment, for reference. All values are averages from the 2003 to 2005 period.

The total additional investment required for Aerospace is almost 6 billion dollars. This is almost 150% of the total investment of 4.2 billion in the base case. This is quite a lot of additional investment for this industry to undertake in a short time period. Without making these investments, however, the capacity to produce the extra aircraft and missiles would not be available, and this would constrain the additional necessary spending until the appropriate investments could be made. The scale of additional investment for Shipbuilding is even greater. Compared with a base case annual investment of 900 million dollars, 3.4 billion dollars of additional capital would have to be put in place. This is almost 4 times the amount of annual investment.

Import Bottlenecks

Aside from Crude oil and a number of other raw materials, the U.S. is not very dependent on imports, compared to Japan or the other NATO countries. But if imports were entirely cut off, say by dangers to shipping, could the U.S. still obtain the supplies for its defense production needs? Unfortunately, that question is beyond the scope of this paper, but we can examine which industries will experience the largest increase of imports specifically attributable to defense, and how easily domestic production could substitute for those imports.

Table 8 shows defense-related imports for several industries which I classify as import-sensitive. They were ranked in the following manner. First, I used IDEPPS to show how much of direct and indirect defense purchases was supplied by imports for each industry.[7] Next, I divided the defense-related imports required for the high defense spending scenario by output in that scenario, and used this ratio to make the ranking. This shows the extra percentage by which domestic production would have to expand to satisfy defense needs if imports were indeed restricted.

Only two industries, Crude oil and Explosives can really be classified as import-sensitive, and at under 15% of output, other uses of domestic production could surely be cut back enough to satisfy defense needs without great disruption. Of course, if our classification scheme were finer, we may be able to locate certain minerals or other raw materials that show a higher level of import dependency, but at this level of analysis it does not appear to be a major bottleneck.

The Need for Skilled Labor

Perhaps more serious than investment or import bottlenecks are those relating to shortages of skilled labor. The concentration of defense production in certain industries, and the special skills required in those industries put certain occupational categories in high demand during a defense buildup. Reports of shortages for skilled scientists and engineers were common during the Reagan buildup, and many of these same categories of workers found the employment situation difficult as defense spending slowed down in the 1990s.

Table 9 shows the occupational categories requiring the greatest percentage increase of employment between the two scenarios. With the large increase in Shipbuilding, the category of Shipfitters must nearly double. Since the Aerospace industry is more diversified, the percentage increases for Aircraft assemblers and Aeronautical and astronautical engineers is not as great, but still in the 25% to 30% range. Electrical and electronics engineers require a large absolute increase – almost 42 thousand. Although some of these categories may require little education or special training, the science and engineering occupations certainly do. It appears that such a dramatic change in the demand for occupational type would meet with obstacles in finding enough of the right kind of skilled labor for producing aircraft, ships and electronics. At any rate, firms would have to offer premium wages to attract the necessary workers.

Conclusions

Although the likelihood of the scenario examined in this paper may seem remote, in many ways the world is a more dangerous place since the breakup of the Soviet Union, and such possibilities should not be dismissed out of hand. Because of the advanced techology, aircraft, missiles, ships and tanks are much more expensive than in the days of Korea or Vietnam. Resources can be used very quickly in even a minor conflict, as evidenced by the Persian Gulf war and Kosovo.

I have tried to indicate in this short paper how macroeconomic input-output modeling can be applied to the policy analysis of economic readiness for two major conflicts, each lasting several years. Using the Inforum LIFT and Iliad models, and DEPPS, I have shown that:

- With a cutback in personal consumption of about $1000 per capita, a defense budget of about $600 billion annually can be sustained for several years without causing general macroeconomic inflationary conditions. Of course, wages of skilled labor categories required to produce defense goods may rise, and the prices of particular goods and services important to defense may also increase.
- Due in part to the relatively low level of defense spending in the U.S. now and in the standard projection, the increases in production and employment in certain industries required to satisfy such a large mobilization would be extreme.
- Attracting the necessary labor and making the appropriate capital investments would take time, before the economy could be producing defense goods at such a high level.
- A restriction of imports would not generally be much of a bottleneck, although supplies of crude petroleum could get tight, and the price would rise.
- Particular categories of labor would be in short supply, such as scientists and engineers, and production workers with special skills.

Constraints in capacity and skilled labor would probably be the most difficult to overcome. However, because of the much larger productive capacity of the U.S. economy today, the total defense expenditure at about 8% of GDP would mean less economic hardship than the 15% of GDP consumed by defense during the peak of the Korean war, or the 10% of GDP during the peak of the Vietnam war.

NOTES

[1] The current administration projection is summarized in the Future Years Defense Plan (FYDP).

[2] The Defense Employment Purchases and Projections System (DEPPS) is used each year with the Inforum LIFT and Iliad models to make projections of the impacts of the defense budget on industries, states and types of skilled labor. DEPPS is described in more detail in *A Guide to DEPPS*.

[3] The defense translator is a matrix of coefficients that translates spending at the level of major program title to spending by industry. The translator is developed by DoD for the period of the FYDP, based on detailed outlays projections. The major program titles are: Military personnel; Operations and maintenance; Procurement; Research, development, testing and evaluation (RDT&E), Military construction and Family housing. Procurement is divided further into Aircraft, Missiles, Weapons and tracked vehicles, Ammunition, Ships and Other.

[4] Some may find it confusing to measure in 2000 constant dollars, when 2000 hasn't arrived yet. However, it is common in budget planning, and in the presentation of defense spending assumptions, to express expenditures in budget year dollars. We use a projected deflator to determine the price level for 2000.

[5] Only in the years 1947 to 1951 and in 1976 have real procurement expenditures been lower than this.

[6] We are assuming that the shares of capital stock by supplying industry are the same as the shares of equipment investment. The capital flow matrix is actually constructed as a matrix of investment flows.

[7] For most direct purchases, DoD follows a policy to buy from domestic producers. However, some direct and about 12% of indirect purchases are imported.

Constraints to Increased U.S. Defense Spending
Figures and Tables

Figure 1. Total U.S. Defense Expenditures: 1939-2005

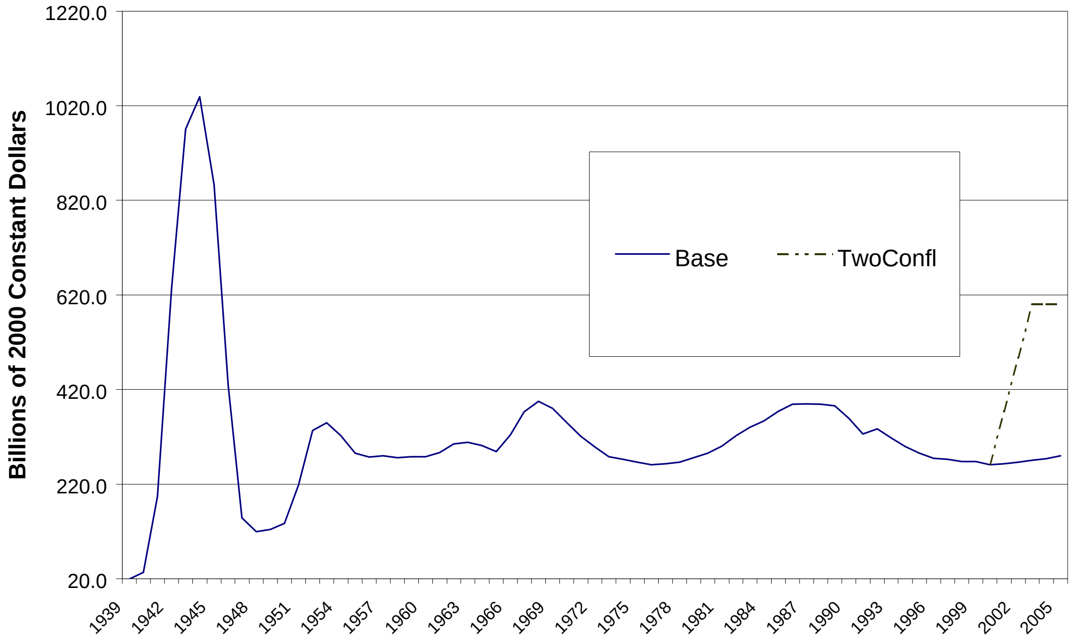

Figure 2. Defense Spending as a Share of GDP
Percentage Calculated in Current Prices

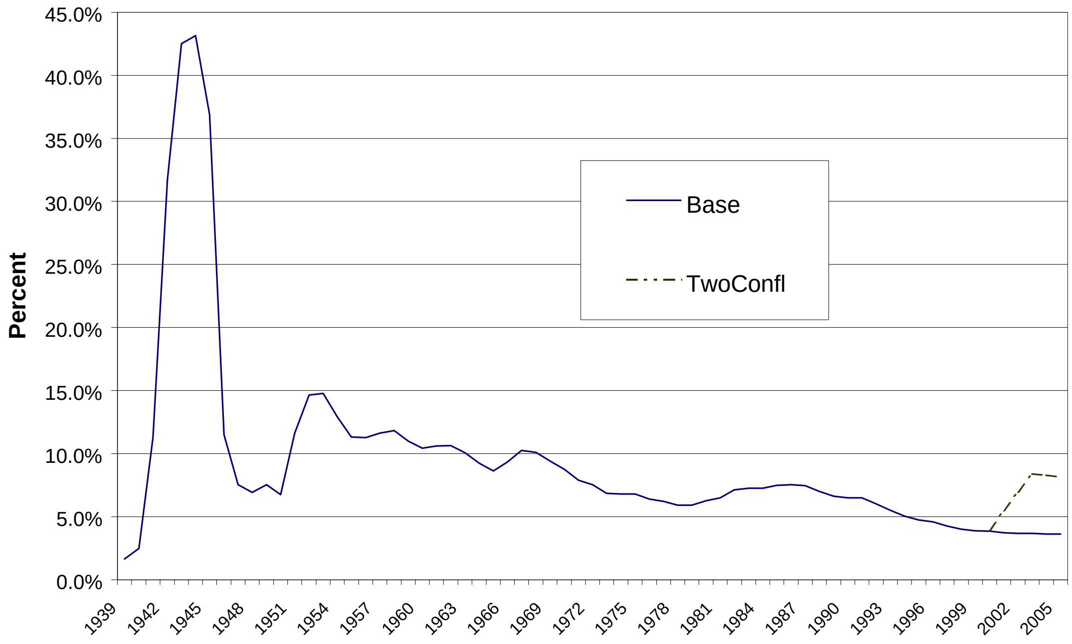

Table 1. Defense Purchases by Title, Base Case

Billions of 2000 Dollars, Calendar Year Basis

	1999	*2000*	*2001*	*2002*	*2003*	*2005*
Military Personnel	74.8	74.4	71.8	72.9	72.9	75.6
Operations & Maintenance	98.1	96.3	98.3	97.4	98.9	104.1
Aircraft	17.8	17.9	19.0	20.2	21.2	22.1
Missiles	2.9	2.8	3.1	3.4	3.7	4.0
Weapons & Tracked Vehicles	1.6	1.5	1.4	1.5	1.6	2.0
Ships & Conversions	8.1	6.9	7.2	7.6	8.4	9.0
Ammunition	0.3	0.3	0.3	0.3	0.3	0.3
Other	17.8	18.5	20.2	21.4	22.6	24.4
Total Procurement	48.6	47.9	51.1	54.3	57.9	61.8
RDT&E	36.7	34.4	33.7	33.2	32.6	31.0
Military Construction	5.2	4.5	4.2	4.9	4.5	4.1
Family Housing	3.9	3.6	3.4	3.5	3.5	3.5
Total Defense Purchases	267.3	261.1	262.6	266.1	270.2	280.0

NOTE: These figures are on a DoD calendar year basis. They have been directly converted from published Green Book fiscal year projections. They differ from NIPA data in that they do not include capital consumption allowances, and are presented in 2000 constant dollars instead of chain-weighted 1992 dollars.

Table 2. Defense Purchases by Title, Alternate Case

Billions of 2000 Dollars, Calendar Year Basis

	1999	*2000*	*2001*	*2002*	*2003*	*2005*
Military Personnel	74.8	74.4	124.6	174.8	225.0	225.0
Operations & Maintenance	98.1	96.3	114.2	132.1	150.0	150.0
Aircraft	17.8	17.9	35.3	52.6	70.0	70.0
Missiles	2.9	2.8	6.9	10.9	15.0	15.0
Weapons & Tracked Vehicles	1.6	1.5	4.3	7.2	10.0	10.0
Ships & Conversions	8.1	6.9	14.6	22.3	30.0	30.0
Ammunition	0.3	0.3	3.5	6.8	10.0	10.0
Other	17.8	18.5	22.3	26.2	30.0	30.0
Total Procurement	48.6	47.9	86.9	126.0	165.0	165.0
RDT&E	36.7	34.4	36.2	38.1	40.0	40.0
Military Construction	5.2	4.5	6.3	8.2	10.0	10.0
Family Housing	3.9	3.6	5.8	7.9	10.0	10.0
Total Defense Purchases	267.3	261.1	374.1	487.0	600.0	600.0

Table 3. Macroeconomic Summary

	2001	2002	2003	2005	Average 2003-5
GDP & Components, billions of 92$					
Gross Domestic Product	7753	7891	8039	8349	8191
	14	*38*	*50*	*-7*	*18*
Personal consumption	5361	5435	5515	5700	5605
	-101	*-150*	*-235*	*-283*	*-262*
Residential structures	279	275	279	289	283
	-2	*-15*	*-23*	*-23*	*-24*
Non-residential structures	217	219	223	231	227
	3	*-6*	*-6*	*-9*	*-8*
Producers' durable equipment	748	775	809	869	839
	-7	*-17*	*-25*	*-23*	*-25*
Exports	1121	1173	1220	1313	1267
	-1	*-1*	*-2*	*-4*	*-3*
Imports	1363	1410	1452	1539	1494
	-16	*2*	*6*	*4*	*4*
Government Purchases					
Federal	378	382	385	393	389
	105	*206*	*307*	*299*	*303*
Defense	241	245	248	256	252
	105	*206*	*307*	*299*	*303*
State & Local	796	806	816	835	826
	0	*1*	*1*	*1*	*1*
GNP deflator, 1992=100	123.3	126.6	130.2	137.8	134.0
	0.3	*0.7*	*1.3*	*2.3*	*1.8*
Surplus (+) or deficit (-)	123	127	137	163	150
	-77	*-168*	*-275*	*-251*	*-266*
Taxes, % personal income	11.4	11.4	11.4	11.3	11.3
	0.5	*0.9*	*1.3*	*2.0*	*1.7*
Real disposable income	5616	5693	5795	6015	5902
	-12	*-45*	*-73*	*-129*	*-103*
Unemployment rate	5.0	5.1	5.1	5.1	5.1
	-0.2	*-0.6*	*-1.0*	*-0.3*	*-0.5*
Civilian labor force	143.4	145.3	147.1	151.0	149.0
	-1.2	*-2.3*	*-3.5*	*-3.5*	*-3.5*
Savings rate	1.5	1.5	1.8	2.3	2.1
	1.6	*1.9*	*2.9*	*2.7*	*2.8*
Interest Rates					
Treasury bonds, 10 year	5.1	5.5	5.4	5.5	5.4
	0.0	*0.7*	*1.2*	*1.1*	*1.2*
Treasury bill rate, 3 month	4.6	4.8	4.8	4.9	4.9
	0.0	*0.6*	*1.1*	*1.0*	*1.1*

NOTE: The first line for each item is the base case value, the second line is the difference from the base.
SOURCE: Simulations using the Inforum LIFT Model.

Table 4. Average Output by Industry, 2003 to 2005

Ranked by Percentage Difference
Millions of 1987 Constant Dollars

	Base	*High*	*Difference*	*Percentage Difference*
22 Ammunition, except small arms	1962	7743	5781	295%
238 Ship building and repairing	8369	25411	17042	204%
24 Small arms	1217	3343	2126	175%
237 Aircraft and missile parts	33005	52811	19806	60%
175 Machine tools, metal cutting types	4726	7127	2401	51%
25 Small arms ammunition	1340	1953	613	46%
176 Machine tools, metal forming types	2389	3339	950	40%
235 Aircraft	52461	68796	16335	31%
21 Guided missiles and space vehicles	15593	19390	3797	24%
236 Aircraft and missile engines	31131	37493	6362	20%
23 Tanks and tank components	1463	1753	290	20%
180 Metalworking machinery, n.e.c.	2678	3165	488	18%
26 Other ordnance and accessories	2316	2684	368	16%
100 Explosives	1046	1194	147	14%
145 Nonferrous castings and forgings	4398	4946	548	12%
220 Radio and TV broadcasting & communication equipment	43214	48417	5203	12%
221 Electronic components	5980	6621	641	11%
295 Engineering and architectural services	95723	105785	10062	11%
217 Household audio and video equipment	3427.6	3777.1	349.4	10%

Source: Calculations from the Inforum Iliad model.

Table 5. Average Employment by Industry, 2003 to 2005

Ranked by Absolute Difference
Thousands of Jobs

	Base	*High*	*Difference*	*Percentage Difference*
238 Ship building and repairing	123	297	174	142%
295 Engineering and architectural services	1081	1199	118	11%
237 Aircraft and missile parts	206	307	101	49%
235 Aircraft	315	388	73	23%
265 Trucking and warehousing	1899	1958	59	3%
290 Research laboratories and management consulting	2119	2149	31	1%
22 Ammunition, except small arms	10	36	26	265%
236 Aircraft and missile engines	184	208	24	13%
21 Guided missiles and space vehicles	102	125	23	23%
175 Machine tools, metal cutting types	47	69	22	46%
220 Radio and TV broadcasting & communication equipment	197	217	20	10%
266 Water transportation	198	210	12	6%
24 Small arms	7	18	12	171%
296 Other professional services, including accounting	1325	1334	9	1%
223 Electronic components, n.e.c.	369	378	9	2%
176 Machine tools, metal forming types	25	33	8	35%
177 Special dies, jigs, molds & cutting tools	289	298	8	3%
246 Search and navigation equipment	171	180	8	5%
169 Construction machinery and equipment	183	190	7	4%
26 Other ordnance and accessories	36	42	6	17%
Total Increase in Jobs for Top 20 Industries			750	

Source: Calculations from the Inforum Iliad model.

Table 6. Industries Comprising the Largest Part of Capital Stock for Aerospace
Millions of 1987 Constant Dollars

			Capital Stock		*Additional Required Investment*	*Base Case Investment*
		Coefficient	*Base*	*High*		
198	Electronic computers	0.142	2315	3159	844	596
235	Aircraft	0.134	2187	2985	797	563
175	Machine tools, metal cutting types	0.123	2009	2741	732	517
275	Wholesale trade	0.086	1404	1916	512	361
199	Computer peripheral equipment	0.082	1337	1824	487	344
233	Motor vehicles and passenger car bodies	0.053	861	1175	314	222
177	Special dies, jigs, molds and cutting tools	0.045	730	996	266	188
207	Instruments to measure electricity	0.034	557	761	203	143
253	Laboratory and optical instruments	0.032	518	707	189	133
176	Machine tools, metal forming types	0.026	424	579	155	109
	Total		16323	22274	5951	4200

Source: Calculations from the Inforum LIFT and Iliad Models. These figures are averages over the 2003 to 2005 period.

Table 7. Industries Comprising the Largest Part of Capital Stock for Shipbuilding
Millions of 1987 Constant Dollars

			Capital Stock		*Additional Required Investment*	*Base Case Investment*
		Coefficient	*Base*	*High*		
233	Motor vehicles and passenger car bodies	0.136	228	693	465	123
275	Wholesale trade	0.102	170	517	347	92
183	Woodworking machinery	0.079	132	402	270	72
212	Welding and soldering equipment	0.074	125	378	254	67
175	Machine tools, metal cutting types	0.062	104	315	211	56
198	Electronic computers	0.061	102	309	207	55
199	Computer peripheral equipment	0.035	59	178	120	32
177	Special dies, jigs, molds and cutting tools	0.034	56	171	115	31
191	Packaging machinery and general industrial machinery, n.e.c.	0.032	54	164	110	29
235	Aircraft	0.030	50	151	101	27
	Total		1673	5082	3409	905

Source: Calculations from the Inforum LIFT and Iliad Models. These figures are averages over the 2003 to 2005 period.

Table 8. Import-Sensitive Defense Industries

	Base	*High*	*Difference*	*Import Share in High Spending Case*
16 Crude oil extraction	2183	3664	1481	14%
100 Explosives	86	216	130	12%
189 Blowers and exhaust and ventilation fans	97	222	125	4%
139 Lead, zinc and oth primary nonferr metal	151	332	181	4%
164 Fabricated metal products, n.e.c.	172	462	291	4%
222 Semiconductors and related devices	1955	3434	1480	3%
217 Household audio and video equipment	68	173	105	3%
236 Aircraft and missile engines	800	1615	815	3%
120 Boot and shoe cut stock and findings	5	13	8	3%
162 Steel springs, except wire	8	21	13	3%

Source: Calculations from IDEPPS.

Table 9. Occupational Categories Requiring the Greatest Increase

	Base	*High*	*Difference*	*Percent Difference*
74 Shipfitters	14.3	26.0	11.7	82%
64 Aircraft assemblers, precision	37.2	47.5	10.3	28%
3 Aeronautical and astronautical engineers	61.0	76.2	15.2	25%
96 Rail transportation workers	2.0	2.4	0.3	16%
60 Aircraft mechanics and engine specialists	168.7	191.5	22.8	14%
19 All other physical scientists	29.9	33.3	3.5	12%
15 Operations research analysts	44.0	48.6	4.6	10%
6 Electrical and electronics engineers	427.8	469.6	41.8	10%
37 Programmers, numerical, tool, and process control	8.6	9.4	0.8	9%
69 All other precision assemblers	38.8	42.2	3.4	9%
71 Boilermakers	16.0	17.4	1.4	9%
8 Mechanical engineers	249.0	270.2	21.2	9%
14 Mathematicians and all other mathematical scientists	26.6	28.6	2.0	7%
5 Civil engineers, including traffic engineers	194.1	207.6	13.4	7%
7 Industrial engineers, except safety engineers	135.4	144.5	9.1	7%

Source: Calculations from LDEPPS.