Report to Congress

Identification of the Requirements to Reduce the Backlog of Maintenance and Repair of Defense Facilities

April 2001

This report responds to Section 374 of H.R. 5408, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (House Report 106-945), enacted into law by Public Law 106-398. That section of H.R. 5408 (appendix 1) calls on the Secretary of Defense to submit a report to Congress identifying a list of requirements to reduce the backlog in maintenance and repair needs of facilities and infrastructure under the jurisdiction of the Department of Defense or a military department. The language further prescribes various elements the report should include or address. This report addresses all the prescribed elements except the expected funding, which will be available after submission of the detailed President's Budget for 2002.

The Department of Defense has been developing improved metrics and tools in this business area and is in the midst of implementing them. We are in a period of transition from old approaches to new, and this report reflects that fact. In addition, the requirements of Section 374 overlap in part the requirements in Section 117 of Title 10, United States Code, which requires an annual report of installations' readiness. The intent of both this Section 374 report and the Installations Readiness Report is to determine the extent of requirements to restore and modernize facilities, and thereby improve the readiness of installations to support defense missions.

Report signed by Deputy Secretary of Defense Wolfowitz on June 13, 2001

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Introduction

Three simultaneous steps are required to reduce the "backlog of maintenance and repair" of Defense facilities. One is to dispose of obsolete assets. The second is to fully sustain remaining assets, to prevent deterioration of our "keeper" facilities and obtain full return on the taxpayers' capital investments. The third is to establish a steady, predictable, and focused investment program to restore, modernize, and replace critical facilities. These three steps, taken simultaneously, are necessary to gain control of the backlog and – more importantly – for adequate support of our service members and effective mission accomplishment.

A. Facilities Sustainment, Restoration, and Modernization

In consonance with the Chief Financial Officers Act and the need for better management information, the Department of Defense (DoD) is improving its methods for computing "deferred maintenance" for facilities and assessing the effects of such deferrals. These new approaches are being implemented DoD-wide in programming and budgeting processes and for annual financial statement reporting purposes. The new methods and metrics are expected to be in place Department-wide for the FY 2003 budget submission.

In previous budget submissions to the Congress and previous financial statements, the Department reported a single, cumulative dollar amount, often referred to as the "backlog of maintenance and repair." The content of the amount (i.e., the projects and other work that made up to the amount) and the methods for computing and reporting the amount, were not standardized, either in the federal government or within the Department.[1] Because of these limitations, the backlog amount was not very useful either for internal managerial use or for external reporting purposes. Consequently, the Department developed the Facilities Sustainment Model (FSM).

The DoD now uses the term "facilities sustainment" to describe the annual maintenance and scheduled repairs for the inventory. Using the FSM, the Department can compute the annual sustainment requirements for 100% of the Department's facilities inventory, using standard benchmarks. The benchmarks, in turn, are based on standard commercial criterion and are unique to individual facility types. The commercial benchmarks are unit costs (i.e., an annual sustainment requirement in dollars for one unit [such as one square foot] of one type of facility and are adjusted for each specific location). The benchmarks were published in the DoD Facilities Cost Factors Handbook, Version 2.0, dated April, 2000, and will be updated annually.

The DoD also created new accounting codes (Program Elements in the Future Years Defense Program database) to capture actual sustainment expenditures that enable measurement of expenses against FSM generated requirements (i.e., to enable planned versus execution type analyses). When fully implemented in FY 2003, the new accounting codes should allow the Department's actual sustainment expenditures to be reported. The difference between the FSM-calculated requirement and the actual expenditures is the deferred sustainment for that year.

[1] The problems inherent in using backlog indicators were recently examined by the Federal Facilities Council, an element of the National Research Council, and will be documented in a new book, now in draft form, titled "Deferred Maintenance Reporting For Federal Facilities: Meeting the Requirements of Federal Accounting Standards Advisory Board Standard Number 6, as Amended."

Any shortfall between the sustainment requirement and the actual funding level could produce an impact on the "backlog" of requirements. In some models, a shortfall would be a simple addition to the prior year backlog. The Department does not believe this simplistic approach will suffice, neither for internal management use nor for external reporting. The impact of deferring sustainment could produce a range of outcomes, ranging from no impact to an impact many times the cost of the original deferral.

To better track the impact of "less-than-full sustainment," and to identify the resources programmed and budgeted to address the requirements that go beyond sustainment, the Department has created a second set of Program Elements in the Future Years Defense Program. These are titled "Facilities Restoration and Modernization," and will reflect funding to be applied to: reduce the "backlog" of restoration requirements; cover emergencies that are not sustainment (such as accidents or fires); and implement higher standards (such as increased privacy in barracks). The Restoration and Modernization resources – currently funded with operations and maintenance appropriations – are supplemented by the military construction appropriation, wherever a project restores or replaces an existing facility. "New footprint" construction does not restore or modernize the existing facilities inventory – it adds to the inventory.

While the FSM is a life cycle based approach to maintenance and repair for sustainment, the methods for developing the Restoration and Modernization requirement are oriented around condition assessment. The overall scope of the Restoration and Modernization requirement is documented in the Department's Installations Readiness Report. That report shows that 69 percent of the facility categories in the current inventory are rated C-3 (significant deficiencies that prevent performing some missions) or C-4 (major deficiencies that preclude satisfactory mission accomplishment).[2] These C-3 and C-4 facilities constitute the essence of the backlog of requirements facing the Department.

A rational approach to dealing with the C-3 and C-4 conditions (or "backlog") must include a commitment to freeze these conditions at the present level. Without this step, efforts to reduce inadequate conditions will be frustrated by simultaneous growth of the backlog. So the first step is to begin sustaining facilities according to standard maintenance and repair task schedules – for example, change filters and valves or replace shingles at intervals specified by the manufacturer. These costs are relatively predictable and must be paid if the full potential life cycle of a facility – and thus the full return on an

Using the FSM, these sustainment costs can be computed in a standard way for any installation. They can also be computed for particular fund sources at that installation – general operations and maintenance funds, family housing funds, non-appropriated funds, and so on. The dollar requirements produced by FSM are fully auditable, down to the individual square foot in a single building on one particular installation.

The FSM was designed as a DoD-level tool, not as a pricing tool for individual facilities. The FSM can compute costs for individual locations and even individual buildings, but since it is based on life-cycle average costs, inaccuracies are introduced when applying the FSM to low levels of detail. Table 1 provides the sustainment requirement individually for those installations that exceed $1.5 billion in physical plant (the approximate cutoff for a typical large base). All the remaining installations are rolled up in one line item; however, the detail for every location is contained in the FSM if requested. These data are from FSM 02, which was developed over a year ago. The FSM 03 is currently in development and will be released in May 2001.

[2] The 69% number for C-3/C-4 facilities is from the FY2001 Installations Readiness Report. The number was 60% in the previous FY2000 report.

Table 1 contains the average annual sustainment cost for the facilities forecasted to be at these locations in the FY02 timeframe – demolition, new construction, closings, excesses, transfers, and other events that affect the inventory are included. Sustainment requirements do not include additional requirements to restore or modernize facilities, such as whole barracks renewal to 1+1 standards or recovery from accidents or acts of God.

Table 1: FSM Version 02* – FY02 Sustainment Costs**

		Funding Sources – Dollars in Millions							
Agency	**Installation (Prime Name)**	**PROC**	**WCF**	**MFH**	**OTH**	**NAF**	**OM**	**TOTAL**	**PRV*** **
Army	FORT SHAFTER	$0	$0	$78	$0	$2	$59	$138	$6,148
USMC	MCB CAMP S D BUTLER OKINAWA JA	$0	$0	$36	$0	$0	$82	$118	$5,629
USAF	EDWARDS AIR FORCE BASE	$0	$0	$12	$0	$0	$60	$73	$5,298
USMC	MCB CAMP LEJEUNE NC	$0	$0	$17	$0	$1	$70	$87	$4,736
Army	FORT HOOD	$0	$0	$29	$0	$0	$62	$91	$4,617
Army	FORT BRAGG	$0	$0	$22	$0	$1	$66	$89	$4,462
USMC	MCB CAMP PENDLETON CA	$0	$0	$34	$0	$0	$58	$92	$4,362
USAF	KADENA AIR BASE	$0	$0	$29	$0	$0	$46	$76	$4,281
Army	FORT LEWIS	$0	$0	$25	$0	$1	$53	$78	$3,966
Navy	NAS KEFLAVIK IC	$0	$0	$19	$0	$0	$45	$63	$3,617
Army	FT CAMPBELL KY	$0	$0	$24	$0	$0	$44	$69	$3,492
Navy	PWC PEARL HARBOR HI	$0	$15	$58	$0	$0	$0	$72	$3,460
USAF	ANDERSEN AIR FORCE BASE	$0	$0	$20	$0	$0	$27	$47	$3,283
USAF	WRIGHT PATTERSON AIR FORCE BASE	$0	$0	$12	$0	$1	$43	$56	$3,137
USAF	VANDENBERG AIR FORCE BASE	$0	$0	$11	$0	$0	$40	$51	$3,023
Army	HAWTHORNE ARMY DEPOT	$0	$0	$1	$32	$0	$0	$33	$3,010
Army	FORT POLK	$0	$0	$26	$0	$0	$30	$57	$3,004
USAF	YOKOTA AIR BASE	$0	$0	$32	$0	$0	$30	$62	$2,979
Navy	NAS NORTH ISLAND SAN DIEGO CA	$0	$7	$0	$0	$1	$40	$47	$2,971
USAF	MISAWA AIR BASE	$0	$0	$22	$0	$0	$31	$53	$2,960
USAF	ELMENDORF AIR FORCE BASE	$0	$0	$18	$0	$1	$34	$53	$2,906
Army	FORT BLISS	$0	$0	$15	$0	$0	$37	$53	$2,836
Navy	NAVSTA NORFOLK VA	$0	$6	$0	$0	$1	$51	$57	$2,819
Army	415TH BSB(P) (KAISERSLTN)	$0	$0	$0	$0	$0	$36	$36	$2,735
Army	FORT RILEY	$0	$0	$21	$0	$0	$32	$54	$2,667
Army	ABERDEEN PROVING GROUND	$0	$0	$8	$0	$0	$38	$47	$2,665
Army	CAMP ZAMA	$0	$0	$11	$0	$0	$37	$48	$2,657
Army	FORT BENNING GA	$0	$0	$20	$0	$0	$40	$61	$2,639
Navy	COMNAVMARIANAS GUAM	$0	$0	$29	$0	$0	$38	$68	$2,604
USAF	HILL AIR FORCE BASE	$0	$10	$6	$0	$1	$23	$40	$2,550
Army	FORT KNOX	$0	$0	$22	$0	$0	$30	$52	$2,532
USAF	EGLIN AIR FORCE BASE	$0	$0	$11	$0	$0	$28	$39	$2,416
Navy	WPNSUPPFAC SEAL BEACH CA	$0	$0	$0	$0	$0	$31	$32	$2,403
USMC	MCB HAWAII KANEOHE	$0	$0	$18	$0	$0	$30	$48	$2,403
Navy	NAVAIRWPNSTA, CHINA LAKE CA	$0	$0	$5	$0	$0	$34	$39	$2,395
USMC	MCAS CHERRY POINT NC	$0	$3	$10	$0	$0	$26	$39	$2,394
USAF	EIELSON AIR FORCE BASE	$0	$0	$13	$0	$0	$27	$40	$2,378
Army	FORT LEONARD WOOD	$0	$0	$12	$0	$0	$35	$48	$2,373
Army	WEST POINT MIL RESERVATION	$0	$0	$23	$0	$0	$33	$56	$2,345
Army	FORT SILL OK	$0	$0	$8	$0	$0	$35	$44	$2,326
Army	REDSTONE ARSENAL	$0	$0	$4	$0	$0	$33	$38	$2,319
USAF	RAMSTEIN AIR BASE	$0	$0	$15	$0	$0	$28	$43	$2,315
Army	FORT CARSON	$0	$0	$11	$0	$0	$36	$46	$2,310
USAF	KELLY AIR FORCE BASE	$0	$10	$2	$0	$0	$23	$36	$2,294
Army	FORT WAINWRIGHT	$0	$0	$18	$0	$0	$24	$42	$2,290
Army	FORT DRUM	$0	$0	$15	$0	$0	$31	$46	$2,278
USAF	KIRTLAND AIR FORCE BASE	$0	$0	$11	$0	$0	$28	$40	$2,273
Army	CALIFORNIA NATIONAL GUARD	$0	$0	$0	$0	$0	$31	$31	$2,253
USAF	HICKAM AIR FORCE BASE	$0	$2	$21	$0	$0	$22	$45	$2,217
USAF	TINKER AIR FORCE BASE	$0	$9	$3	$0	$0	$20	$33	$2,167
Army	MCALESTER AAP	$0	$22	$0	$0	$0	$0	$22	$2,164
Army	WHITE SANDS MISSLE RANGE NM	$0	$0	$7	$0	$0	$39	$46	$2,136
USAF	THULE AIR BASE	$12	$0	$0	$0	$0	$18	$30	$2,132

Table 1: FSM Version 02* – FY02 Sustainment Costs**

		Funding Sources – Dollars in Millions							
Agency	**Installation (Prime Name)**	**PROC**	**WCF**	**MFH**	**OTH**	**NAF**	**OM**	**TOTAL**	**PRV*** **
Army	411TH BSB(P) (HEIDELBERG)	$0	$0	$18	$0	$1	$26	$45	$2,126
USAF	NELLIS AIR FORCE BASE	$0	$0	$9	$0	$0	$25	$35	$2,110
USAF	TRAVIS AIR FORCE BASE	$0	$4	$12	$0	$0	$19	$35	$2,072
USAF	ROBINS AIR FORCE BASE	$0	$8	$6	$0	$0	$18	$31	$1,990
USAF	MCCLELLAN AIR FORCE BASE	$0	$8	$3	$0	$0	$18	$30	$1,935
Army	293RD BSB (MANNHEIM)	$0	$0	$17	$0	$0	$25	$42	$1,926
Navy	NAVAIRWARCENACDIV PATUXENT MD	$0	$10	$4	$0	$0	$15	$29	$1,923
Navy	NAF ATSUGI JA	$0	$0	$10	$0	$0	$24	$34	$1,919
Navy	NSY PUGET SOUND BREMERTON WA	$0	$29	$0	$0	$0	$1	$30	$1,907
Army	FORT STEWART, GA	$0	$0	$13	$0	$0	$29	$42	$1,903
Army	U.S. ARMY KWAJALEIN ATOLL	$0	$0	$6	$0	$1	$25	$32	$1,900
Navy	NAVBASE SAN DIEGO CA	$0	$0	$62	$0	$0	$0	$62	$1,885
Army	STUTTGART	$0	$0	$18	$0	$1	$24	$43	$1,875
Navy	PWC YOKOSUKA JA	$0	$8	$36	$0	$0	$0	$45	$1,869
Navy	NTC GREAT LAKES IL	$0	$0	$0	$0	$1	$34	$35	$1,862
USMC	MCAGCC TWENTYNINE PALMS CA	$0	$0	$12	$0	$0	$22	$34	$1,860
USAF	MCGUIRE AIR FORCE BASE	$0	$3	$10	$0	$0	$17	$31	$1,837
Army	CRANE ARMY DEPOT	$0	$14	$0	$0	$0	$0	$14	$1,811
Navy	NAVSTA PEARL HARBOR HI	$0	$0	$0	$0	$0	$34	$35	$1,758
Army	414TH BSB (HANAU)	$0	$0	$19	$0	$0	$20	$39	$1,753
Navy	NAVSUPPFAC DIEGO GARCIA IO	$0	$0	$0	$0	$0	$29	$29	$1,746
USAF	HOLLOMAN AIR FORCE BASE	$0	$0	$8	$0	$0	$18	$26	$1,730
USAF	MINOT AIR FORCE BASE	$0	$0	$18	$1	$0	$14	$33	$1,723
Navy	NAS PENSACOLA FL	$0	$0	$3	$0	$0	$27	$31	$1,717
USAF	OFFUTT AIR FORCE BASE	$0	$0	$15	$0	$0	$21	$36	$1,716
Navy	NAVSTA GUANTANAMO BAY	$0	$0	$9	$0	$0	$24	$33	$1,692
Navy	PWC GUAM	$0	$11	$0	$0	$0	$1	$12	$1,681
Army	FORT RICHARDSON	$0	$0	$16	$0	$0	$17	$33	$1,668
Army	222ND BSB (BAUMHOLDER)	$0	$0	$18	$0	$0	$17	$35	$1,664
Navy	NAVSTA ROOSEVELT ROADS PR	$0	$1	$8	$0	$0	$20	$29	$1,661
Army	417TH BSB(P) (WUERZBURG)	$0	$0	$12	$0	$0	$20	$32	$1,655
USAF	SHEPPARD AIR FORCE BASE	$0	$0	$6	$0	$0	$24	$30	$1,655
Navy	PWC NORFOLK VA	$0	$10	$19	$0	$0	$0	$29	$1,628
USAF	USAF ACADEMY	$0	$0	$9	$0	$0	$27	$37	$1,623
Navy	COMFLEACT YOKOSUKA JA	$0	$0	$0	$0	$0	$30	$30	$1,610
USAF	LACKLAND AIR FORCE BASE	$0	$0	$3	$0	$0	$27	$30	$1,585
USAF	ANDREWS AIR FORCE BASE	$0	$0	$10	$0	$1	$16	$27	$1,577
Army	221ST BSB (WIESBADEN)	$0	$0	$22	$0	$1	$15	$37	$1,576
USAF	MOUNTAIN HOME AIR FORCE BASE	$0	$0	$9	$0	$0	$14	$23	$1,558
USAF	GRAND FORKS AIR FORCE BASE	$0	$0	$12	$2	$0	$13	$27	$1,551
Army	NTC AND FORT IRWIN, CA	$0	$0	$17	$0	$0	$16	$33	$1,543
USAF	VOGELWEH (FAMILY HOUSING)	$0	$0	$19	$0	$0	$9	$28	$1,537
Army	409TH BSB (GRAFENWOEHR)	$0	$0	$3	$0	$0	$24	$27	$1,526
Army	FORT MCCOY	$0	$0	$0	$0	$0	$26	$26	$1,526
Army	FORT RUCKER AL	$0	$0	$6	$0	$0	$17	$24	$1,522
Navy	NAS PT MUGU CA	$0	$13	$6	$0	$0	$7	$26	$1,522
USMC	MCAS BEAUFORT SC	$0	$0	$6	$0	$0	$14	$19	$1,509
Various	All Remaining Installations	$273	$760	$675	$37	$29	$3,145	$4,919	$286,864

* FSM 02 has been modified and improved and will be replaced by FSM 03 in May 2001

** Sustainment requirements exclude the requirements to restore and modernize facilities or recover from accidents or acts of God

*** Plant Replacement Value is calculated using standard factors from DoD Facilities Cost Factors Handbook

B. Facilities Demolition and Disposal

The Department's formal Facilities Demolition and Disposal program has been underway since 1998. The goal of the program is to eliminate 80 million square feet of obsolete facilities during the FY 1998-2003 period. Program results have been routinely recorded in the Department's reports under the Government Performance and Results Act, and will again be included in the Department's Annual Report to the President and Congress (Performance Measure 2.3.7).

In the period FY 1998-2000, the Services demolished and disposed of 44.9 million square feet, 5.5 million square feet ahead of the plan, representing 56 percent of the long-term goal. The Department has expended $473 million dollars to achieve the cumulative FY 1998-2000 result -- an average of $10.53 per square foot demolished. The cost per square foot goal at the three-year mark is $11.36 -- meaning results so far are about 7 percent under target cost, although costs are rising. In addition to square footage, the Services are demolishing selected non-building facilities (non-square footage). Examples include obsolete communication towers and storage tanks.

The plan is to demolish and dispose of an additional 35 million square feet (or square feet equivalents in the case of non-buildings) during the period FY 2001-2003. The Department has funded the program and fully expects to achieve the goal – if trends continue, probably some time before the end of FY 2003. Since demolishing facilities often involves extensive coordination – such as arranging for alternate space – the precise timing of each specific project is difficult to predict. Hence, demolition totals by installation during a particular 12-month period are subject to significant error. Table 2 provides the aggregate totals, and more detail is provided in Appendix 2.

Table 2: Demolition and Disposal Programs

Cumulative Results – Square Feet in Millions	FY98	FY99	FY00	FY01	FY02	FY03
Goal	11.09	24.59	39.42	54.98	72.18	80.10
Actual	16.49	30.76	44.89			

C. Legacy Backlog Indicators

Although the Department of Defense has for many years reported a backlog of maintenance and repair, it has become increasingly apparent that the backlog metric is flawed – for a number of reasons. The problems with the metric are not unique to the Department of Defense but rather are common throughout the government. A list of the problems would include these:

– **BMAR is too expensive to maintain** – if properly maintained, it requires annual condition assessments; however, the cost of performing these assessments is prohibitive.

– **BMAR is inaccurate** – since it is too expensive to maintain, unfunded annual maintenance and repair is often simply compounded and inflated without any reference to actual conditions.

– **BMAR is subjective** – to the extent it is based on actual condition assessments, the assessments themselves are often biased, especially those conducted by facility users rather than an independent team of engineers not associated with the facility, installation, or major command.

- **BMAR provides only partial coverage** – if it was accurate, it might represent restoration requirements, but it sheds no light on annual sustainment or modernization requirements.

- **BMAR is not interoperable** – there are no universal standards for computing the metric – not in DoD, in the federal government, or industry. Therefore, comparative analysis is not possible.

- **BMAR is unverifiable** – to the extent it is collected at all, the data exists in stand alone, off line systems and is not linked with the official real property inventories – so it is impossible to confirm where the backlog exists or even if it exists. There is no link to funding databases.

- **BMAR is not timely** – the metric is a backward-looking snapshot that sheds no light on what has been accomplished in the meantime or what the needs are in the future.

- **BMAR does not account for all sources of mitigation** – an item in the backlog may be included in a future construction, demolition, or privatization project. Therefore, requirements may be double counted.

- **BMAR performs illogically** – it goes up when more funds are available, because facility managers are more likely to identify deficiencies when the probability of obtaining funding increases.

- **BMAR has lost credibility** – it has gone up continuously for at least two decades with little or no impact on resource allocation.

An earlier effort – directed and funded by Congress circa 1993-1994 – to verify BMAR by developing a standard, DoD-wide Condition Assessment System, was abandoned after spending $50 million. The system failed due to high implementation costs. Subsequently, the Air Force moved to a Facilities Investment Metric, and the Army moved to an Installations Status Report. In FY 2000, the Department as a whole moved to the Installations Readiness Report, at the direction of Congress.

Despite the many problems and the migration away from the backlog metric, the BMAR concept lived on until recently in budget exhibits and briefings, although the actual content of the numbers being presented had changed significantly. The label still said "BMAR," but for some military services the data was something else entirely.

The non-standardized methods being used by the Military Services and defense agencies to compute the reported "BMAR" further reduced the value of the metric for making resource decisions. Meantime, other new tools for generating requirements have been and are being developed. Hence, beginning with the FY2002 budget submission, the Department no longer solicits a "BMAR" report from the Military Departments. The Department's FY2000 financial report required by the CFO Act also reflects the new approach (see Appendix 3).

The period between FY2000 and FY2003 will be a time of transition. Appendix 4 to this report contains the final "BMAR" numbers reported by the financial managers of the Military Departments, as of September 30, 2000. The narratives provided (as well as the numbers themselves) provide evidence of many of the problems with "BMAR," most notably the lack of standard methods for computation. The precise content of these numbers – what is included or excluded – differs among the Military Departments and is in some cases not discernable.

Given the many caveats, as of September 30, 2000, the reported backlogs, contained in Appendix 4, are:

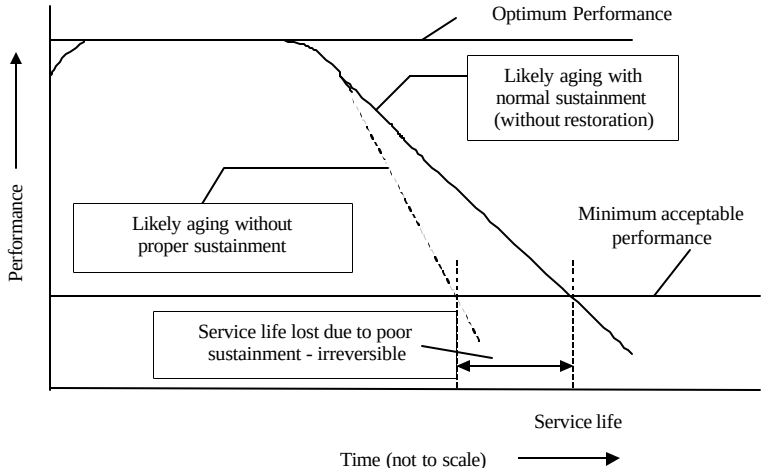
	$ Billion
Army	33.1
Navy	11.3
Air Force[3]	5.9

D. Facilities Readiness and Recapitalization Requirements

Sustaining facilities according to standard maintenance and repair task schedules will allow them to remain effective through their expected life cycle. At the end of that cycle the facility will likely be worn out or functionally obsolete, and will need to be "recapitalized" by either replacement or large-scale renovation. In the event routine sustainment has not been properly funded and performed, the expected life cycle is reduced – the facility wears out or breaks down prematurely. Other events – such as storms, accidents, or sudden and unexpected increases in standards (such as force protection in the wake of bombings) – can also produce premature recapitalization requirements. These recapitalization costs go beyond sustainment.

Figure 1 illustrates the conceptual link between facilities sustainment and restoration/modernization requirements. When facilities reach a level of minimum acceptable performance, they have to be restored, modernized, or replaced. The time it takes to reach the minimum level of performance is particularly dependent on whether the facilities have been properly sustained.[4]

Figure 1: Facilities Performance



In the Department of Defense, there are two ways to view recapitalization requirements:

- The backlog of restoration and modernization needs (based on what has not been done in the past)
- The continuing recapitalization requirement (based on what needs to be done in the future)

The backlog of restoration and modernization is based on an assessment of present conditions, and is captured and reported in the Department's Installations Readiness Report (IRR). The IRR is required by Section 117 of Title 10, United States Code, and is contained in the Quarterly Readiness Report to Congress, submitted in February, annually. The IRR identifies facilities that are below minimum acceptable performance in terms of readiness support.

The IRR provides information for nine facility classes for each of the major commands. The nine facility classes are:

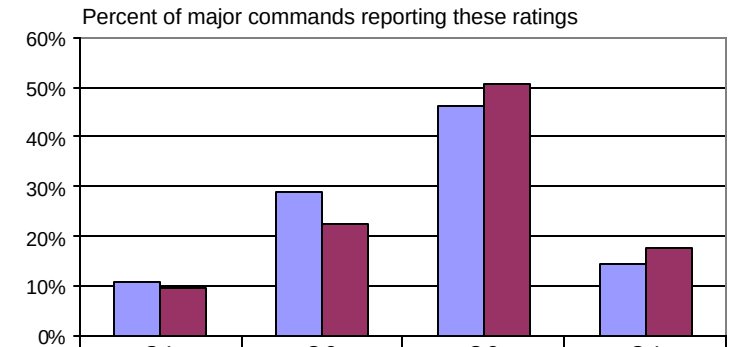
[3] Air Force would like to re-iterate the point already made in this report – that the numbers shown contain different content and so are not comparable.
[4] Figure 1: National Research Council (1993)

- Operations and Training: Airfields, piers and wharves, training ranges and classrooms, recruit facilities, armories, aircraft parking and hangars, refueling hydrants, flight simulators
- Mobility: Facilities directly related to mobilization of forces, including staging areas and transportation systems
- Maintenance and Production: Vehicle and avionics maintenance shops, tactical equipment shops, aircraft maintenance hangars, foundries, ammunition demilitarization facilities
- Research, Development, Testing and Evaluation: Test chambers, laboratories, research buildings
- Supply: Warehouses, hazardous material storage, ammunition storage
- Medical: Hospitals, medical and dental clinics
- Administrative: Office space, computer facilities
- Community and Housing: Family housing, barracks and dormitories, dining halls, recreation and physical fitness facilities, child development centers, fire and police stations, visitors' quarters, elementary and high schools
- Utilities and Ground Improvements: Power production, distribution and conservation systems, water and sewage systems, roads and bridges, water pollution abatement, wastewater treatment facilities, fuel storage tanks and containment areas

The IRR report itself contains the details by facility class. Overall, the status of facilities readiness is summarized in Figure 2. As shown, the number of classes reported below minimum acceptable performance (C-3 and below) is at 69%, up from 60% last year.

During the past year, the Department developed a specific budget line item to address the backlog of C-3 and C-4 facilities. The program is titled *Facilities Restoration and Modernization* and is visible in the Future Years Defense Program. In the FY 2002 President's Budget, the program is funded with O&M dollars and supplemented with military construction funds. The Department is considering integrating this program in the future so that all restoration and modernization funding, regardless of appropriation, can be tracked in one program.

Figure 2: Facilities Readiness



	C-1	C-2	C-3	C-4
FY00	11%	29%	46%	14%
FY01	9%	22%	51%	18%

C-1 -- only minor facility deficiencies with negligible impact on capability to perform missions
C-2 -- some facility deficiencies with limited impact on capability to perform missions
C-3 -- significant facility deficiencies that prevent performing some missions
C-4 -- major facility deficiencies that preclude satisfactory mission accomplishment

The Military Services are currently working on methods to compute the cost to restore C-3 and C-4 facilities to minimal acceptable performance (C-2) or full readiness performance (C-1). The Office of the Secretary of Defense is monitoring this work and intends to standardize future reporting using one methodology. This work is not complete, as was reported in the Department's FY2000 financial statements required by the CFO Act (Appendix 4). The standard method will be based on the cost factors contained in the *DoD Facilities Cost Factors Handbook*, as requested in paragraph (b) 4 of Section 374 P.L. 106-398.

Although the work is not done, preliminary analysis shows the cost will be very high. The cost to restore all the IRR-rated C-3 and C-4 facilities to minimal C-2 status has been initially calculated at $62 billion, given the following assumptions:

– no funds are spent on C-1 facilities
– all the facilities rated C-3 and C-4 are restored (rather than demolished or replaced)
– the cost to restore a C-3 facility to minimal C-2 status is 10% of its replacement value
– the cost to restore a C-4 facility to minimal C-2 status is 30% of its replacement value
– minimal C-2 status is defined as 20% below full-up C-1 status
– full-up C-1 status is defined as zero deficiencies
– plant value is distributed in a pattern that matches the C-ratings

If the assumptions are changed such that all facilities (C-2, C-3, and C-4) are restored to full-up C-1 status with no deficiencies, the cost increases to $164 billion. This preliminary analysis is shown in Table 2:

Table 2: Preliminary Analysis of Restoration Costs Under Various Assumptions[5]

	Current Situation			Scenario 1 Full Up C-1		Scenario 2 Full Up C-2		Scenario 3 Minimal C-2	
	FY01	PRV $B	FPI*	Cost $B	FPI *	Cost $B	FPI *	Cost $B	FPI *
C-1	9%	$56		Assume Zero Deficiencies					
C-2	22%	$134	-15%	$20	0%	$7	-10%	$0	-15%
C-3	51%	$304	-30%	$91	0%	$61	-10%	$30	-20%
C-4	18%	$106	-50%	$53	0%	$42	-10%	$32	-20%
Total				$164		$110		$62	

"FPI" is the extent of performance deficiency assumed to exist in the current situation, and that will remain under the three scenarios. For example, under Scenario 3 there is no investment in C-2 facilities so they remain at 15% degraded performance, while C-3 facilities are improved from 30% degraded performance under the current situation to 20%.

A second way to compute restoration and modernization needs is *the continuing recapitalization requirement* that is a fact of life for facility owners. This method focuses on the requirement that results from the normal aging of the inventory under management, rather than looking for specific examples of inadequate performance that currently exist, usually as a result poor sustainment or inadequate levels of recapitalization in the past. The recapitalization metric looks forward to the future, long-term recapitalization requirement rather than backward at a backlog that needs to be fixed.

The Department has spent considerable time developing a standard *recapitalization metric* for use throughout the Department. The metric is based on an engineering assessment of the expected life of the various facility classes in the Department's inventory, where expected life is defined as the number years a properly sustained facility should provide service before requiring a major restoration or replacement project. These expected lives range from 25 years for perimeter security (i.e. fences) to 100 years for sewers, with most buildings in the 50-75 year range. Department-wide for all facility types and all agencies and services, the average estimated expected life for a fully sustained inventory is 67 years.

The Department has recently completed a research project with the purpose of reviewing commercial benchmarks for expected facility life (Appendix 5). The research demonstrates that the Department's 67-

[5] This initial analysis is based on several assumptions that need further analysis and validation. The analysis should be viewed as a demonstration of methodology and as a preliminary assessment of the potential magnitude of the problem.

year average for all facilities would be at the extreme far end of most life cycle estimates. Hence, the Department's recapitalization requirement based on a 67-year cycle would be a very conservative estimate of requirement.

The *recapitalization metric* removes from the current inventory those facilities that the Department does not plan to recapitalize for various reasons. These reasons include:

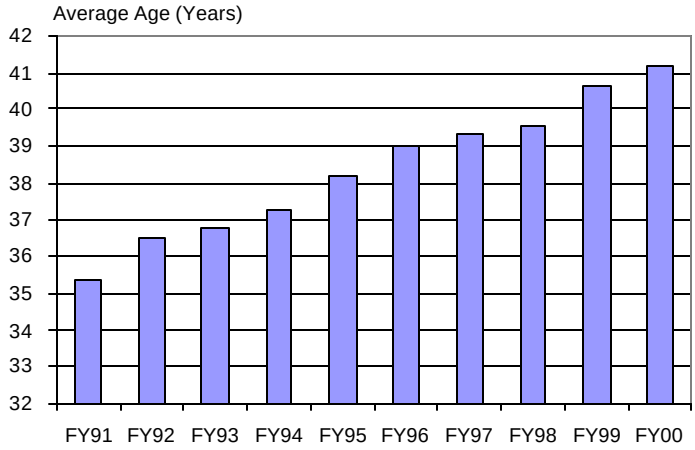
- facilities planned for demolition
- facilities planned for disposal by transfer to other entities
- facilities planned for one time use (e.g. chemical demilitarization facilities)
- facilities that would be recapitalized by appropriations other than regular military construction or general O&M funds (e.g. family housing or a strategic missile silo)
- facilities that would be recapitalized by sources outside the Department (e.g. facilities in Japan)

The *recapitalization metric* includes in the investment pool the following funds:

- all military construction funds that replace or revitalize facilities
- all operations and maintenance funds that recapitalize facilities through restoration or modernization
- planning and design funds related to recapitalization projects
- all construction funded under Base Realignment and Closure

Given these inputs, the recapitalization metric forecasts a continuing annual requirement of approximately $6 billion to achieve and maintain a 67-year recapitalization schedule. If this level of recapitalization was set and maintained indefinitely, the average plant-value adjusted age of DoD facilities would stop increasing (at the current 41 years (Figure 3)) and would gradually decrease and level off at about 33 years. This compares to a commercial benchmark of 23 years.[6]

Figure 3: Aging Trends - DoD



Going back to the Preliminary Analysis of Restoration Costs presented in Table 2, it would take $62 billion to implement Scenario 3, which restores all current C-3 and C-4 facilities to minimal C-2 status. If the Department immediately implemented a 67-year facilities recapitalization schedule at approximately $6 billion per year, it would take about 10 years to buy out the current readiness backlog.

There are other events that should be considered, however they are beyond the scope of this paper. A 10-year "backlog buyout" timeframe would be stretched by any accidents, acts of God, or new restoration and modernization requirements that develop beyond those contained in the FY2001 Installations Readiness Report. On the other hand, new demolitions, disposals, or closures beyond those already forecasted would reduce the timeframe. Finally, such a recapitalization program would generate efficiencies and savings by:

[6] Building Owners and Managers Association International, 1998 BOMA Experience Exchange Report, Washington DC, 1998

reducing facilities operations costs (e.g. for utility payments and services)
– reducing incidental damages caused by facility failures (e.g. aircraft engine damage caused by "foreign objects" – loose concrete – on the runway).

E. Current Plans and Programs

These data will be provided as soon as practicable after the detailed FY 2002 President's Budget is forwarded to Congress later this year.

F. Goals and Metrics

As discussed earlier, the Department of Defense is in the process of improving its methods and metrics for computing requirements and tracking performance of facilities and related programs. One of the major goals set out in the Defense Facilities Strategic Plan is "Right Tools and Metrics." Some of the metrics are fully developed (such as the Facilities Sustainment Model) as are some of the goals (such as the goal to eliminate gang latrines in barracks by FY 2008). However, this is an ongoing, annual process and the status of goals and metrics vary by program area.

Program Area	Metrics	Goals	Status
Facilities Demolition	Square feet demolished/disposed	80 million square feet during FY1998-2003	Being implemented. Is included in DoD GPRA reports.
Facilities Sustainment	(1) Commercial benchmarks by facility type (2) Difference between plan and execution	(1) Full sustainment of planned inventory (2) Zero beginning in FY03	(1) Developing defense planning guidance (2) Implementation to begin in FY03
Facilities Restoration and Modernization (Including Housing)	(1) C-3 and C-4 facilities as % of total (2) Facilities Performance Index (3) Recap Rate (4) Number of inadequate houses (5) Number of barracks with gang latrines	(1) TBD (2) - 20% by…. (3) 67 years by…. (4) Zero by FY 2010 (5) Zero by FY 2008	(1) Still researching (2) Still researching (3) Still researching (4) Being implemented (5) Being implemented
Installation Services	Not established	Not established	Future initiative

G. Long Range Planning for Facilities

Paragraph b (6) of Section 374 P.L. 106-398 asks: "What initiatives are underway to identify facility and infrastructure requirements at military installations to accommodate new and developing weapon systems and prepare installations to accommodate these systems?"

In the narrow sense, each Military Service has a process for identifying facility requirements associated with new systems and equipment. A summary of these processes is documented in Appendix 6. These processes are more oriented to accommodating new systems once the systems have entered the initial procurement processes, as opposed to a process that prepares installations in advance to be ready to accommodate a modern military, independent of any specific procurement program or initiative.

In a broader sense, the Department is taking steps to prepare installations for the future. Much of that work has already been documented in this report. Under the guidance of the Installations Policy Board, the Department has developed a Defense Facilities Strategic Plan and an Installations Posture Statement. The vision, goals, and initiatives contained in these documents underpin all the improvements for installations implemented and underway in the Department of Defense.

To meet the future effectively, we have established four strategic goals:

- **Right Size** : Locate, size, and configure defense installations and facilities to meet the requirements of today's and tomorrow's force structures

  Right Quality: Acquire and maintain defense installations and facilities to provide superior-quality living and work environments
- **Right Resources**: Leverage resources—money, people, and equipment—to achieve the proper balance between requirements and available funding
- **Right Tools and Metrics**: Improve facility management and planning by embracing best business practices and taking advantage of modern asset-management techniques and performance-assessment metrics

With a 2020 vision for installations, the Department can achieve its vision for facilities:

Installations and facilities are available when and where needed, with capabilities necessary to effectively and efficiently support DoD missions.

Appendix 1: Legislative Language[7]

IDENTIFICATION OF REQUIREMENTS TO REDUCE BACKLOG IN MAINTENANCE AND REPAIR OF DEFENSE FACILITIES

(a) Report To Address Maintenance and Repair Backlog – Not later than March 15, 2001, the Secretary of Defense shall submit to Congress a report identifying a list of requirements to reduce the backlog in maintenance and repair needs of facilities and infrastructure under the jurisdiction of the Department of Defense or a military department.

(b) Elements of Report – At a minimum, the report shall include or address the following:

(1) The extent of the work necessary to repair and revitalize facilities and infrastructure, or to demolish and replace unusable facilities, carried as backlog by the Secretary of Defense or the Secretary of a military department.

(2) Measurable goals over specified time frames, for addressing all of the identified requirements.

(3) Expected funding for each military department and Defense Agency to address the identified requirements during the period covered by the most recent future-years defense program submitted to Congress pursuant to section 221 of title 10, United States Code.

(4) The cost of the current backlog in maintenance and repair for each military department and Defense Agency, which shall be determined using the standard costs to standard facility categories in the Department of Defense Facilities Cost Factors Handbook, shown both in the aggregate and individually for each major military installation

(5) The total number of square feet of building space of each military department and Defense Agency to be demolished or proposed for demolition, shown both in the aggregate and individually for each major military installation.

(6) The initiatives underway to identify facility and infrastructure requirements at military installation to accommodate new and developing weapons systems and to prepare installations to accommodate these systems.

(c) Annual Updates – The Secretary of Defense shall update the report required under subsection (a) annually. The annual updates shall be submitted to Congress at or about the time that the budget is submitted to Congress for a fiscal year under section 1105(a) of title 31, United States Code.

[7] Section 374 of H.R. 5408, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (House Report 106-945 enacted into law by P.L. 106-398 dated October 30, 2000

Appendix 2: Facilities Demolition and Disposal Program

Defense Reform Initiative
Demolition and Disposal Of Excess and Obsolete Facilities
FY 1998-2000 Results

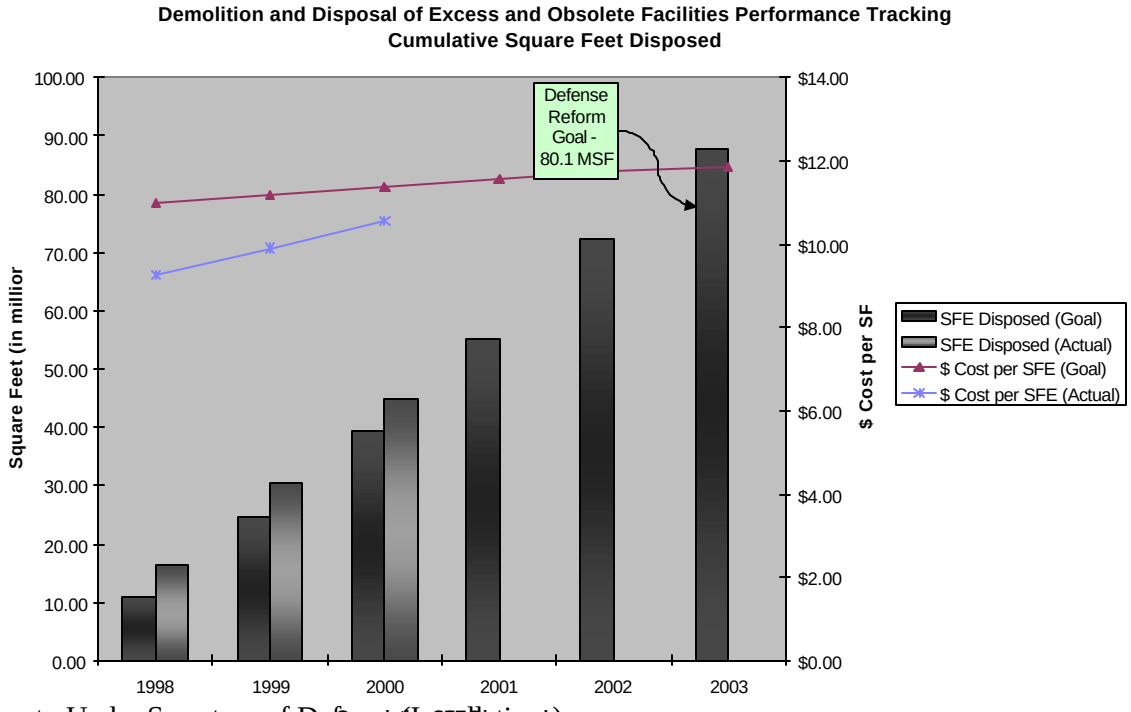
The Services demolished and disposed of 44.9 million square feet from FY1998-2000. After completing three years of a six-year initiative, the Department of Defense is 5.5 million square feet ahead of its plan and has achieved 56% of its long-term goal (80.1 million square feet disposed by the end of FY2003). Planned and completed results are:

Square Feet Demolished (in millions)	Planned	Completed
FY 1998	11.1	16.5
FY 1999	24.6	30.8
FY 2000	39.4	44.9

The Marine Corps, after demolishing 665 buildings, has exceeded their goal of 2.2 million square feet, but plans, as do most of the other Services, to continue to identify and demolish obsolete facilities in the future.

The Department has expended $473 million dollars to achieve the cumulative FY1998-2000 result – an average of $10.53 per square foot demolished. The cost per square foot goal at the three-year mark is $11.36 – meaning results so far are about 7 percent under target cost. The lower cost is primarily for three reasons:

- lower cost projects in the early years (e.g. more vacant, easy-to-demolish buildings),
- use of technology (such as the Air Force's "building grinder"), and
- higher than anticipated salvage prices.



However, costs will continue to rise as the easier demolition candidates are removed from the inventory. Future demolition projects, such as wastewater treatment plants and electrical power stations, are constructed with more concrete and masonry, thus costing more to demolish. The increase is also caused, in part, by costs of consolidation since some of the current demolition candidates are not vacant.

Also, in addition to buildings (square footage), the Services are demolishing selected non-building facilities (non-square footage) from the inventory. FY 2000 examples include fuel tanks and engine test pads. These projects are funded within the demolition expenditures but are in addition to the Defense Reform Initiative (DRI) square feet targets. At present the costs for these non-buildings are included in the overall reported costs for buildings.

Through FY 2000, DoD has avoided approximately $95 million in operations and maintenance costs due to the demolition investment in FYs 1998 and 1999. In FY 2000 and continuing each year thereafter, DoD will avoid approximately $90 million in costs due to these demolition efforts, and future demolitions will increase this figure. Consistent with DRI, the Services will retain any savings for use in other high priority programs.

Based on current results, the initiative is on track to achieve the Defense Reform goal and may achieve the goal sooner than planned.

Demolition/Disposal of Obsolete Facilities: Results

Cumulative Results	FY98	FY99	FY00
SFE Disposed (Actual)	16.49	30.76	44.89
Army	10.70	20.72	28.62
Navy	2.72	4.71	7.47
Marine Corps	1.05	1.50	2.17
Air Force	2.02	3.83	6.63
Funds (Actual) - DoD	150.61	303.27	472.67
Army	104.00	203.60	303.50
Navy	27.00	57.00	87.00
Marine Corps	7.20	10.80	17.30
Air Force	12.41	31.87	64.87
$ Cost per SFE (Actual)	9.13	9.86	10.53
Army	9.72	9.83	10.60
Navy	9.93	12.10	11.65
Marine Corps	6.86	7.20	7.97
Air Force	6.14	8.32	9.78

Appendix 3: Department of Defense FY2000 Deferred Maintenance Report under CFOA

General Property, Plant, and Equipment
Real Property Deferred Maintenance
As of September 30, 2000
(Dollars in Millions)

1. Property Type / Major Class		FY 2000			
	2. Restoration Prior[8]	Annual Sustainment[9]			6. Restoration Ending
		3. Required	4. Actual	5. Difference	
Buildings[10]	-	3,416.6	2,653.3	(763.3)	-
Structures[11]	-	1,287.3	999.0	(288.3)	-
Total	-	4,703.9	3,652.4	(1,051.6)	-

Narrative Statement

The Department of Defense (DoD) is in the process of improving its methods and metrics for computing "deferred maintenance" on buildings and structures and for tracking the effects of the deferral. The DoD now uses the term "facilities sustainment" to describe maintenance and scheduled repairs. The term "maintenance" or "deferred maintenance" is imprecise, since it includes some repair work. The DoD is reporting the annual "deferred sustainment," which includes the maintenance and scheduled repairs that have been deferred. In the future the DoD will also report the "restoration" requirement, which is the deferred major repairs that go beyond sustainment.

This new approach is being implemented DoD-wide for the budget process and for annual financial statement reporting purposes. These methods and metrics were used this year, for the first time, to generate sustainment requirements reflected in the Department's budget submission to the Congress for the FY 2002 budget submission. The new methods and metrics are expected to be in place Department-wide for the FY 2003 budget submission. These new methods did not exist prior to FY 2000, consequently, the table above reflects the transition to the new methods (see footnotes).

In previous budget submissions to the Congress and previous financial statements, the Department reported a single, cumulative dollar amount, often referred to as the backlog of maintenance and repair. The content of the amount (i.e., the projects and other work that made up to the amount) and the methods

[8] The reported cumulative prior year restoration requirements are: Army – $33 billion, Navy
billion for working capital funded facilities, Air Force – $6 billion. These amounts are not reported in the current table since the methods for computing the amounts and their content are not yet standardized within DoD. Consequently, no amount is reported in Column 6. Restoration Ending.

[9] These amounts are estimates. The FSM FY 2002 model was used to project backward to FY 2000, for real property owned by the active DoD Components (Working Capital Fund real property is not included). Since there are no data on the buildings and structures allocation for executed funding, the funding allocation is assumed to match the allocation of the building and structures requirement.

[10] For the purposes of this statement, buildings are defined as facilities measured in square feet.

[11] For the purposes of this statement, structures are defined as facilities measured in units other than square feet.

for computing and reporting the amount, were not standardized, either in the federal government or within the Department. Because of these limitations, the amount was not very useful either for internal managerial use or for external reporting purposes. Consequently, the Department developed the Facilities Sustainment Model (FSM).

The table above indicates the new direction taken by the Department. Using the FSM, the Department proposes to compute the annual sustainment requirements (Column 3) for the Department's real property, using standard benchmarks. The benchmarks, in turn, are based on standard commercial criterion and are unique to individual facility types. The benchmarks are unit costs (i.e., an annual sustainment requirement in dollars for one unit [such as one square foot] of one type of facility and adjusted for each specific location). The benchmarks are published in the *DoD Facilities Cost Factors Handbook, Version 2.0*, dated April 2000. The Department, using the FSM, can calculate the facilities sustainment requirement utilizing a standard methodology. This methodology is the equivalent of a life cycle costing approach, which is recognized as an acceptable approach within the federal-wide accounting standard.

The DoD also created new accounting codes (Program Elements) to accommodate capturing actual sustainment expenditures that enable measurement of expenses against FSM generated requirements (planned versus execution). When fully implemented in FY 2003, the new accounting codes should allow the Department's actual expenditures to be reported (Column 4 of the table). The difference between the FSM calculated requirement (Column 3) and the actual expenditures (Column 4) is the deferred sustainment for the year (Column 5).

The significance of the difference between a requirement and the actual funding level (Column 5) on the ending restoration requirement (Column 6) is under study at this time. In some models, a shortfall would be a simple addition to the prior year restoration backlog. The Department does not believe this simplistic approach will suffice for internal management use nor for external reporting. The impact of deferring sustainment could produce a range of outcomes, ranging from no impact to an impact many times the cost of the original deferral.

While the FSM is a life cycle based approach to maintenance and repair for sustainment, the methods for developing the Restoration and Modernization requirement are oriented around condition assessment. The overall scope of the Restoration and Modernization requirement is documented in the Department's *Installations Readiness Report*, dated March 2000. That report shows that 60 percent of the facilities in the current inventory are rated C-3 (have serious problems) or C-4 (do not support the mission). In the future, the Department will estimate the cost and report these cost requirements using standard factors.

Appendix 4: Deferred Maintenance Reporting FY 2000

Department of the Army

General Property, Plant, and Equipment
Real Property Deferred Maintenance Amounts
As of September 30, 2000
($ in Thousands)

Property Type/Major Class	
1. Real Property	
A. Buildings	$33,050,000
B. Structures	0
C. Land	0
2. Total	$33,050,000

Narrative Statement:

The $33,050,000 thousand reflected above represents deferred RPM (Real Property Maintenance) costs for FY 2000. Shown are the quality improvement costs to C-1 for RPM funded facilities. This total excludes Non-Appropriated funded activities, dependent schools, other DOD funded facilities, Army Working Capital Fund, Commissaries and AAFES facilities.

General Property, Plant, and Equipment
Real Property Deferred Maintenance Amounts

As of September 30, 2000
($ in Thousands)

General Funds Property Type/Major Class	Amount
1. Real Property	
A. Buildings	$7,539,779
B. Structures	2,434,856
2. Total	$9,974,635

Narrative Statement:

The federal government lacks standards on the methodology to estimate deferred maintenance information that must be reported based upon Financial Accounting Standards Board requirements. Until these requirements are defined at the government-wide level, the DON will include in its Required Supplemental Information to its financial statements deferred maintenance amounts reported for General PP&E Real Property that were reported during the budget process. In addition, the DoD chairs a Chief Financial Officer Council project tasked with developing and recommending government-wide methods for determining deferred maintenance estimates and reporting guidance.

For Navy installations, the reported backlog of maintenance and repair (BMAR) is premised on a continuous fence-to-fence inspection of facilities at each installation, the results of which are reported each year in the Annual Inspection Summary (AIS) collected by the Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM). The AIS is an inventory of each facility's BMAR deficiencies conducted per the guidelines of the NAVFAC MO-322 and include the cost to repair the stated deficiency that remain as a firm requirement at the end of the fiscal year. Deficiencies do not include alterations, additions, equipment installation, or recurring and preventative maintenance.

The BMAR reported in the above Real Property Deferred Maintenance table includes both "critical" and "deferrable" maintenance actions as defined in the Office of the Chief of Naval Operations, OPNAVINST 11010.34B, Instructions for Preparation and Submission of the Type "A" Annual Inspection Summary and Narrative Assessment. Critical deficiencies constitute maintenance actions that should be done immediately or programmed for accomplishment within the current fiscal year and meets at least one of the following criteria below:

- Environmental – A deficiency posing an unacceptable risk of environmental damage or violation of statutory or regulatory requirements.
- Loss of Mission – A deficiency that has degraded mission capability contributing to a C3 or C4 facility condition rating in a standard base report (BASEREP) mission area.
- Safety – A deficiency with a risk assessment code of 1, 2, or 3.
- Quality of Life – A deficiency that has degraded the habitability or use of the barracks, galley, MWR facilities or other personnel support and service facilities.

Navy categorizes maintenance actions that do not meet the above criteria, as “deferrable” actions and records are maintained separately by category. Navy only reports “critical” deficiencies in the budget exhibits prepared for Congressional review.

BASEREP Rating Procedures:

C1 - Has fully met all demands placed upon it in a mission category throughout the reporting period.

C2 - Has substantially met all demands of the mission category throughout the reporting period with only minor difficulty.

C3 - Has only marginally met the demands of the mission category throughout the reporting period, but with major difficulty.

C4 - Has not met vital demand of the mission category.

Risk Assessment Code is an expression of risk that combines the elements of hazard severity and mishap probability. The codes are:

1 - Critical
2 - Serious
3 - Moderate
4 - Minor
5 - Negligible

For the Marine Corps, facility deficiencies are identified through three primary sources: facilities inspections performed by our maintenance departments using technical guidance provided by COMNAVFACENGCOM published MO322 "Inspection of Shore Facilities"; operator inspections (e.g., plant operators in our water, heat, and waste water treatment); and customer input.

Locally (activity) funded maintenance actions are summarized by Cost Account Code (CAC) and reported in summary to Headquarters, Marine Corps (HQMC). Larger actions, above the local commanders’ authority, funded by HQMC (defined as "M2" special projects) which comprise approximately two-thirds of the total Marine Corps real property backlog, are reported on a project basis to HQMC and an on-site validation made by HQMC personnel. Marine Corps annotates which deficiencies are critical and deferrable but all maintenance and repair work remaining as a firm requirement of the annual plan but lack resources are included as deferred maintenance at year-end. The Marine Corps only reports BMAR less than four years old in budget exhibits prepared for Congressional review.

No changes have been made to condition requirements or standards from the previous reporting year. The Marine Corps data continues to include all qualifying deferred maintenance.

In general, Marine Corps deficiencies that have been identified through one of the methods described above are evaluated, prioritized and scoped for cost. The work is either accomplished during the current fiscal year or "deferred" due to lack of resources. The work that is deferred is what is called our Backlog Maintenance and Repair (BMAR). Costs for demolition of facilities have been excluded from the BMAR.

Summary information for Navy activities' deficiencies can be obtained from a review of the summary AIS collected and maintained by COMNAVFACENGCOM. Specific details for each of the deficiencies, by site and location, can be obtained from the major commands. The Marine Corps maintenance actions can be reviewed through HQMC. Facility summaries can also be obtained through a review of the Naval Facilities Assets Data Base (NAVFAC P-164) for both Navy and Marine Corps activities. A listing of each deficiency is too voluminous for this narrative summary.

The cost assessment survey method is used in developing BMAR data for real property.

The DON general funds do not have any material amounts of deferred maintenance for General PP&E Personal Property, Heritage Assets, or Stewardship Land. In addition, when collecting the deferred maintenance data, the DON does not identify if the buildings and structures are multi-use Heritage Assets. Therefore, the DON cannot report a separate amount of deferred maintenance for multi-use Heritage Assets.

General Property, Plant, and Equipment

Real Property Deferred Maintenance Amounts

As of September 30, 2000
($ in Thousands)

NWCF Property Type/Major Class	Amount
1. Real Property	
A. Buildings	$891,031
B. Structures	397,857
2. Total	$1,288,888

Narrative Statement:

[Note: Narrative statement removed. Is essentially the same narrative statement under General Funds above]

General Property, Plant, and Equipment
Real Property Deferred Maintenance Amounts
(Amounts in Thousands) As of September 30, 2000

(a) Property Type/Major Class	(b)
1. Real Property	
A. Buildings	$5,908,000
B. Structures	
2. Total	$5,908,000

Narrative Statements:

The Air Force Office of the Civil Engineer, Operations and Maintenance Division (AF/ILEO) estimates a $4.442 billion deferred maintenance liability for Fiscal Year (FY) 2000. It is a $329 million increase from the FY 1999 liability. The figure comes from the Fiscal Year 2000 Facility Investment Metric (FIM) and includes amounts for heritage assets and stewardship lands. This amount was not reported in Budget Exhibit OP-28 because the definition and accounting category for "sustainment" is new in FY 2002.

The Air Force Office of Civil Engineering Housing Division (AF/ILEH) estimates a $1.466 billion deferred maintenance liability. It is a $221 million increase from the FY 1999 liability. This figure comes from the Fiscal Year 1999 Real Property Maintenance Model, a system that consists of 1998 housing condition assessments on a three-year cycle performed by licensed civilian architects and engineers. The figure includes amounts for heritage assets.

No procedures are currently in place to separate the deferred maintenance amounts for buildings and structures.

Appendix 5: Whitestone Research Report on Target Replacement Lives

Note: The Final Report produced by Whitestone Research at this appendix was completed as a research project for the Department of Defense. One purpose of the research was to review commercial benchmarks for expected facility life. That section of the Whitestone Research Final Report (section 3.1) is reproduced here.

Implementation of the Department of Defense Sustainment Model

Final Report

January 31, 2001

Prepared for:

Office of the Deputy Under Secretary of Defense (Installations)

Prepared by:
Jacobs Facilities, Inc
1300 Wilson Blvd, Suite 500
Arlington, VA 22209

Whitestone Research
610 Anacapa Street
Santa Barbara, CA 93101
whitestoneresearch.com

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Definition of Facilities Target Replacement Lives

The purpose of this task is to identify and evaluate sources of service life (Target Life) benchmarks for DoD facility analysis categories.

3.1 The Service Life of Structures

Service life has been defined as "the period of time over which a building, component, or subsystem provides adequate performance…" (NRC, 1991). Ideally, it is the equivalent of the design life intended by the architect and owner (Sjostrom et al, nd); it may or may not be the equivalent of economic life, "the period of time over which an investment is considered to be the least-cost alternative for meeting a particular objective" (ASTM, 1995).[12] Service life is reduced by obsolescence, which Lemer (1996) attributes to changes in technology, regulation, economic market forces, and social values.

Service life is an important factor for a variety of accounting and planning activities. In the private sector, service lives are the basis for calculating depreciation and maintenance funding requirements for bonds and mortgages (there is a Society of Depreciation Professionals that work for public utilities). Architects consider component service life as a design criteria, though often secondary to cost, "It is conventional wisdom that the service life of much low-end speculative construction barely exceeds the mortgage or initial lease term," (Dorris, 1997); efforts are underway to define standards for service life prediction (Frohnsdorff and Martin, 1996). Commercial appraisers use service life assumptions to calculate the remaining life of buildings (Marshall & Swift, 1998).

Federal economists at the Bureau of Economic Analysis use estimated service lives of equipment and structures to derive depreciation rates and calculate national wealth statistics (Fraumeni, 1997). Similarly, federal tax depreciation schedules are based on the service life of capitalized assets (Brazell, Lowell, Walsh, 1989). The economic analysis required of all federal agencies for large procurements (OMB-A76) often relies on service life assumptions, as do the studies required specifically for military construction (MILCON) and large maintenance (O&M-funded) projects. Service life assumptions are necessary for calculating the remaining useful life of the DoD inventory (Facility Aging Model) and sustainment funding requirements (Army Aim-High Program).

3.2 Estimates of Service Lives

There is no standard set of assumptions regarding service lives. Moreover, there are few data sources from which to derive estimates; aside from undocumented expert experience (Marshall & Swift), there are the depreciation schedules defined by the Treasury and the closely held facility data from regulated utilities. Another source is the survey of commercial buildings

[12] ASTM, *1995 Annual Book of ASTM Standards, Volume 4.07*. Philadelphia, 1995. Page 776.

conducted in 1995 by the Department of Energy. In this survey we find the distribution of buildings by age in the U.S. inventory, as shown below.

Table 3.1 U.S. Inventory of Buildings by Age, 1995

Year constructed	1919 or before	1920 to 1945	1946 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1992	1993 to 1995
Age	>75	75-50	49-36	35-26	25-16	15-6	5-3	<3
Buildings (000)	353	562	867	718	813	846	218	202
Percent	7.7	12.3	18.9	15.7	17.8	18.5	4.8	4.4

Table 3.2 BEA Facility Service Lives

	Service life (years)
Private nonresidential structures	
Industrial buildings	31
Mobile offices/17/	16
Office buildings/17/	36
Commercial warehouses/17/	40
Other commercial buildings/17/	34
Religious buildings	48
Educational buildings	48
Hospital and institutional buildings	48
Hotels and motels/18/	32
Amusement and recreational buildings/18/	30
All other nonfarm buildings/18/	38
Railroad replacement track/19/	38
Other railroad structures/19/	54
Telecommunications/19/	40
Electric light and power/19/:	
Before 1946	40
1946 and later	45
Gas/19/	40
Petroleum pipelines/19/	40
Farm/20/	38
Mining exploration, shafts, and wells:	
Petroleum and natural gas/21/:	
Before 1973	16
1973 and later	12
Other/21/	20
Local transit/22/	38
Other/22/	40
Residential capital (private and government)	
1-to-4-unit structures-new/20/	80
1-to-4-unit structures-additions and alterations/20/	40
1-to-4-unit structures-major replacements/20/	25
5-or-more-unit structures-new/20/	65
5-or-more-unit structures-additions and alterations/20/	32
5-or-more-unit structures-major replacements/20/	20
Mobile homes/20/	20
Other structures/20/	40
Government nonresidential structures/33/	
Buildings:	
Industrial	32
Educational	50
Hospital	50
Other	50
Nonbuildings:	
Highways and streets	60
Conservation and development	60
Sewer systems	60
Water systems	60
Other	60

The Bureau of Economic Analysis published expected service lives as part of their national wealth calculations in 1997 (Katz and Herman, 1997). Our conversations with BEA economists indicated that these estimates, shown below, were largely legacy data thought to be based on a dated Treasury tax bulletin (Bulletin F). The BEA was aware of no “better” estimates though did mention that there was little collaboration in this area among other federal agencies.

Marshall & Swift is a commercial publisher whose Marshall Valuation Service contains a list of typical building lives. These are recommended life expectancies based on “appraisers opinions and studies of actual mortality, condition of survivors, and ages at which major reconstruction or change of occupancy has taken place.” Life expectancies are reported for an extensive list of occupancy types, and are broken out by construction class--from A to S—in which class A is higher quality and conforms to higher building code standards. For example, the life expectancy of a “good to excellent” quality office building varies from 60 to 50 years, depending on construction class; the range for a “low cost” quality office building is 50 to 40 years. Note that the entire list of typical building lives is included in Appendix 2.

Table 3.3 Comparison of Service Life Estimates

	BEA (private)	BEA (government)	Marshall & Swift
Office Building	36	50	45-55
Warehouse	40	32	35-50
Church	48	50	35-60
Hospital	48	50	35-50
Single Residence	80	na	30-65

Shown above is a comparison of service life estimates for selected building types from BEA and Marshall and Swift. We make the comparison more as a basis for discussion rather than to draw any firm conclusions. Unable to review primary source materials from either series, we have little basis for recommending the use of one over the other. In general, the comparison shows a broad range of estimates for each building type with only one contradiction, the 80-year service life for a single residence shown by BEA, versus the 30-65 year range estimated by Marshall & Swift.

One troubling observation is that the estimated service lives from both series seem low when compared with the actual distribution of the U.S. inventory (shown previously); for example, 8 percent of existing commercial buildings in 1995 were over 75 years old, and 20 percent were over 50 years old. These findings are the same when we look specifically at office buildings. Over 18 percent of existing office buildings are older than longest service life (55) indicated by any of the estimates. Our assumption is that many of these buildings have undergone extensive renovations.

The BEA makes a distinction between private and government buildings, and assumes that government buildings have longer service lives across all building types. This is surprising, given the common assumption that government space is less expensive and less well maintained, yet a finding from another source (BOMA, 1998) supports the idea.[13] According to the BOMA survey, the average age of government-owned buildings in its sample was 51 years, while the average for private buildings was 23.

3.3 An Experiment with Life Cycle Cost-Based Service Lives

We explored an alternative approach for determining service lives, one that uses a forecast of life-cycle maintenance costs and a backlog threshold. Our premise was that many buildings are torn down because of an accumulated backlog of repairs, and we knew specifically that DoD (or at least the Air Force) will not allow O&M monies to be spent on a project exceeding 70 percent of the facilities replacement cost (Sherbo, 1999). Thus if we found that at some building age a moderate backlog of say, 5 years—which is not unusual as managers tend to accumulate large maintenance tasks over time into a single renovation—exceeded the 70 percent threshold, that building age could be seen as an estimate of service life. And the approach could be applied separately for each facility category.

For a sample office building, we first estimated the year-by-year maintenance costs over a 50-year period using the Whitestone MARS system. Then for each year we summed the costs from

[13] Building Owners and Managers Association International, *1998 BOMA Experience Exchange Report*, Washington DC, 1998.

the previous 4 years, simulating a rolling 5-year backlog, and expressed it as a percentage of the building replacement cost. The highest 5-year backlog we found was 22 percent of replacement cost at age 18.

Would such a backlog typically compel the owner to demolish? A study of universities (APPA, 1989) found that the average campus had a backlog of 20 percent of replacement cost and a range of average building age from 21 to 50 years.[14] This suggests that a 20 percent backlog is not a likely threshold for retiring facilities, and certainly is less than the 70 percent threshold used by the Air Force.

3.4 Actuarial Approach to Estimating Service Life

Another approach to estimating service lives would be to use actuarial methods and data from public utilities. There is a branch of actuarial practice that specializes in models of depreciation for fixed assets, primarily for the benefit of regulated industries. Our discussions with a number of analysts (Baracca, Jensen) indicate the methodology is straightforward, and the data requirements can be minimal. With one approach (simulated plant record model) statistically valid estimates can be derived from just the number of buildings added and retired to an inventory by year. The difficulty with this approach is convincing the utilities to provide the necessary data, which they consider proprietary.

3.5 Recommendation for Service Life Estimates

We identified only two readily available sources for service life estimates with the detail and credibility necessary. Comparing the estimates, there were few contradictions between the BEA and Marshall & Swift series but together they defined a very broad range of estimates for each facility type. Neither series provides source materials sufficient to differentiate on the basis of methodological rigor or quality of data. The Marshall & Swift series provides service lives for much more specific types of facilities than does BEA, but we have no way of knowing if such detail is justified by the data or merely represents an exercise in extrapolation. Thus, our recommendation is to simply use the BEA government series.

[14] Rush and Johnson, *The Decaying American Campus* . APPA, Washington DC. 1989

Appendix 6: Service Statements on Preparing Installations

This appendix provides Service specific statement on the Congressional question: "What initiatives are underway to identify facility and infrastructure requirements at military installations to accommodate new and developing weapon systems and prepare installations to accommodate these systems?"

Army

Army Regulations 70-1, Materiel Acquisition, and 700-127, Integrated Logistics Support (ILS), address planning for the supportability of new, individual items of equipment/systems. The facilities element is one of ten elements of ILS that is 'directed toward ensuring that all required permanent or semi-permanent…facilities are available concurrently with system fielding.' ILS directs the Materiel Developers (MATDEVS) to review and address the facility impact of all new systems.

Early in the process Headquarters Department of the Army (HQDA) coordinates with the MATDEVS to develop the operational requirements for equipment/systems. With the MATDEVS HQDA influences the design and selection criteria of equipment/systems to minimize the impact on existing facilities and limit the need for new construction to support equipment/systems requirements.

In coordination with the MATDEVS the Corps of Engineers (COE) develops a Support Facility Annex (SFA) to identify facilities requirements for a new system. The SFA is used by gaining Major Commands (MACOMS) to plan for and program any new or modified facilities for new systems.

The MATDEVS coordinate with the MACOMS to develop facilities plans for the new equipment/systems. The MATDEVS then coordinate their facility requirements with their Headquarters Department of the Army (HQDA) proponent who programs for the projects and submits them for inclusion in the Military Construction, Army (MCA) FutureYears Defense Program (FYDP). HQDA internally coordinates the FYDP to ensure the facilities plan matches the fielding schedule for new equipment/systems throughout the Army.

The Unit Set Fielding (USF) process was developed to address the coordinated fielding of multiple pieces of equipment/systems to a specific unit. USF is a HQDA initiative that integrates the fielding of equipment into a System of Systems management approach at unit level. USF mandates a time-phased process to manage all requirements, including facilities, for fielding unit sets of equipment/systems. The USF process facilitates the coordination of facility construction/renovation with the Unit Set Fielding Modernization Schedule (USFMS) to ensure, when fielded, the entire unit set of equipment/systems are properly supported at the receiving installation.

In support of Army Transformation HQDA has formed a work group to develop the Transformation Template for Installations. This work group includes functional proponents and the Major Commands. This document will provide a template of all the facilities, environmental, contract support, and BASOPS requirements for a transformed force. The work group's initial focus is a template for the Interim Brigade Combat Team (IBCT) requirements at an installation. Once completed the template will be applicable (with minimal alteration) as a reference for any installation in the world.

The Army is acutely attuned to the need to plan early for the suitability of facilities in support Army Transformation and force modernization. The Army's goal is to ensure that when new

equipment/systems arrive at an installation the facilities at that installation fully support the mission requirements of that equipment/system.

Navy

The Navy has procedures in place to ensure that installations have the facilities and capabilities needed to accommodate the arrival of new weapons systems.

Starting with the conception of new weapons systems, facilities professionals on the staffs of OPNAV N7, NAVAIR, and NAVSEA identify facility requirement as warfare concepts are developed for air, surface, and subsurface platforms. The Integrated Logistics Support Process compliments this where facilities professionals from NAVFAC and OPNAV participate with NAVAIR and NAVSEA on Integrated Product Teams to develop new weapon systems. Additionally, facilities professionals in OPNAV routinely review and provide input to planning documents such as the DOD Annual Report to Congress, Navy Posture Statement, Navy Strategic Planning Guidance Document, and CNO's Vision-Presence-Power, where new weapon systems are discussed.

Once new weapon systems are identified, facility professionals at NAVFAC and subordinate field divisions engage with technical counterparts at NAVAIR, NAVSEA, Fleets, and installations to determine facility requirements.

As weapon systems enter budget programming cycles, facility improvements to accommodate those systems ideally are also programmed. NAVFAC and subordinate field divisions, along with the installation management claimants, execute facility design and construction to coincide with weapon system arrival.

Air Force

The Air Force currently has procedures in place that ensure installations have the facilities and capabilities necessary to support initial and full operational capability for all new weapon system acquisitions. These methods are formalized in several documents including AFI 63-101, Acquisition System; AFI 63-107, Integrated Weapon System Management Program Planning and Assessment; AFI 10-601, Mission Needs and Operational Requirements Guidance and Procedures; AFI 10-602, Determining Logistics Support and Readiness Requirements.

The Integrated Weapon System Management (ISWM) establishes a Single Manager (SM) for each weapon system to ensure all aspects of planning, development, sustainment and evolution of the system is addressed. An Operation Requirements Document (ORD) is developed (as specified by DoD 5000.2-R) which describes the overall mission area, the type of system proposed, and the anticipated operational and support concepts in sufficient detail for program and logistics support planning. Among other issues, the ORD establishes support objectives for initial and full operational capability. It discusses system requirements relating to communications and information, transportation and basing, and standardization and interoperability. The ORD details the basing requirements (main and forward operating bases) and associated facilities needed for training. The ORD also addresses the provisioning strategy for the system including any unique facility, shelter or environmental compliance requirements.

As part of the acquisition process, SAF/AQ starts notifying the appropriate host MAJCOM (CE, XP, XO, and others) and other appropriate Air Staff organizations (ILE, XP, XO and others) when a new weapon system is being considered. The host MAJCOM leads a multi-functional team to determine what facilities are needed to support the new weapon system, including test and training. The SPO generates the required facility list. As a baseline, recent beddowns are used for historical reference. The possible basing sites are narrowed down to the most reasonable alternatives; those that meet the mission purpose and need for the proposed action. Site surveys are conducted at these candidate bases. Available facilities are compared to new weapon system facility requirements. These studies not only include operational facilities but also include support facilities such as dormitories, fire stations, technical training facilities and test site facilities. The off-base impact is also assessed: school populations and housing just to name two. The best funding method is studied during the site visits, both MILCON and O&M funding are considered depending on what's available. The Environmental Impact Analysis Process (EIAP) based on the National Environmental Policy Act (NEPA) also helps determine the best fit by considering and documenting environmental effects of proposed AF actions. Currently MAJCOMS POM for the new mission requirements along with the rest of their current mission and force restructuring MILCON. These projects compete with all Air Force requirements for limited funding.

Marine Corps

Background. To better understand how the Marine Corps addresses infrastructure requirements of a new weapon system, an understanding of how a weapon system comes from an idea to fielding is needed. First, The Marine Corps' Combat Development Process (CDP) focuses on capabilities vice equipment. When a requirement for a warfighting capability is identified a Universal Needs Statement (UNS) is generated. The UNS can be generated by anyone or any organization in the Marine Corps and acts as the "work request" for comment and evaluation of the requirement. The Assessments Branch at Marine Corps Combat Development Command (MCCDC) is the organization that coordinates and tracks the UNS through the evaluation cycle. Evaluation of the requirement is conducted using DOTES. DOTES, which stands for Doctrine, Organization, Training and Education, Equipment, and Support and Facilities, provides a standardized and task organized framework for evaluation of the requirement. The participants in the evaluation begin first with the five Marine Air Ground Task Force (MAGTF) Advocates – Command Element, Ground Combat Element, Aviation Combat Element, Combat Service Support Element and Supporting Establishment. They will look internally to see if solution already exists or if this is a new requirement. If it is new requirement, MCCDC will further study and analyze it to come up with several possible Solution Courses of Action (COAs). The COAs, of which one must be a non-material solution, are forwarded to the Assistant Commandant of the Marine Corps (ACMC) for COA selection. If the COA selected is an equipment solution then the acquisition process begins.

Infrastructure Requirements. Evaluation and input of infrastructure requirements occurs throughout the CDP. The first evaluation is during the initial review of the UNS prior to any equipment solution being chosen. Follow on input occurs through out the acquisition process via coordination with Marine Corps Systems Command (MARCORSYSCOM) as they develop the new system. It is important to note that throughout the development process, DOTES will continue to be used to address potential impacts – everything from training the operators and maintainers, to development of doctrine and tactics, to material life cycle management.

Deputy Commandant Installations and Logistics (I&L) acts as the Commandant of the Marine Corps' advocate for the Supporting Establishment. Facilities and Services (LF) division, within I&L, addresses infrastructure requirements. LF is the conduit between MCCDC, MARCORSYSCOM and the bases and

stations to coordinate the infrastructure requirements a new system may bring. Depending upon the scope and type of infrastructure requirement, funding is addressed in a number of ways. If Military Construction (MILCON) and/or Environmental Impact Studies are required, it is desirable to have the weapon program cover the costs. If not, then these requirements are funded at the HQMC level. Smaller facilities upgrade requirements and/or less environmental documentation requirements may be funded at the local level, although it is still desirable the program funds them. In any case, the goal is to have the facilities on hand when the weapon system is fielded.

Installations Planning. The Marine Corps recognizes the relationship of installations to overall readiness. Marine Corps Strategy 21 is the vision the Marine Corps will use to carry it forward into the 21st century. Supporting this, the Marine Corps has an Installations Campaign Plan (ICP) and an Installations 2020 (I-2020) Plan that will provide the vision, goals and direction to move Marine Corps Installations into the 21st century. Using the ICP and I-2020 as the roadmap, installations will use a variety of local plans to include Base Master Plans, Air Installation Compatible Use Zone plans, Integrated Natural Resource Plans and Compatible Land Use Plans to ensure they are positioned to support the warfighter, his equipment, and family.