

Welcome

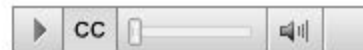


PERSONNEL COSTS

Learning Objectives

Upon completion of this lesson, you will be able to:

- Identify where personnel costs occur in Operating and Support cost estimates
- Explain the role of the Manpower Estimate Report
- Describe the general assumptions that affect personnel cost estimates
- Explain how to price personnel
- Identify major sources of personnel cost data



Closed Captioning

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- Describe the general assumptions that affect personnel cost estimates,
- Explain how to price personnel, and
- Identify major sources of personnel cost data.

Why Is This Important?

Personnel costs represent a very large percentage of O&S costs.

Estimating personnel costs isn't always as straightforward as it might seem.

The PSM must be a part of the discussion that determines how many people, what kinds of people, and what special circumstances might apply that would affect the total cost.



Estimating Personnel Costs

Personnel costs are estimated by counting all the personnel involved with operating and supporting a system and then multiplying by the right cost per person. Assumptions regarding the estimate can sometimes be documented before estimating the costs, but not always.

So the problem is identifying the right people to count, estimating the number of personnel, and then selecting the correct cost per person. As we have seen, this is one area where early reliability and maintainability decisions can have a profound effect on the O&S cost, above and beyond the non-personnel costs of maintenance. A major source of controversy in acquisition Life Cycle Cost (LCC) estimates is to determine how Reliability and Maintainability (R&M) improvements will affect manning.

$$\text{Personnel Costs} = \sum_{\text{type}=1}^n (\text{Personnel Qty}_{\text{type}} * \text{Personnel Cost}_{\text{type}})$$


Personnel Quantities: The Basics

Staffing is driven by workload, and workload is driven by tasks. Tasks are driven by maintenance planning based on the reliability and maintainability of the system. Unscheduled tasks are often driven by reliability factors. Scheduled tasks are based on the supportability analysis performed as part of the system design process. Both are affected by the inherent maintainability of the system. If reliability is over-estimated, and the time to restore the system under-estimated, our initial O&S cost estimates could be wide of the mark.

$$\text{Staffing} = \left(\frac{\text{Hours}}{\text{Task}} \right) * \left(\frac{\text{task}}{\text{day}} \right) // \left(\frac{\text{Hours/Day}}{\text{Person}} \right)$$

Support Concept
Optempo & Inventory

Personnel Policies

Maintainability

Reliability

Knowledge Review

You think estimating personnel costs is pretty straightforward once the correct cost per person is determined. Your cost estimator replies, "In order to have accurate personnel costs, you also need to know _____."

- type and quantity
- age and number
- rank and age
- years of service and rank

Check Answer

In order to have accurate personnel costs, it is critical to calculate the correct cost per person as well as the **type and quantity** of personnel.



Manpower Estimate Report (MER)

Before going any further, let's look at the one of the basic sources of information regarding manning. The policy documents listed below require a [Manpower Estimate Report](#) be prepared for major program decision points as shown.

- **10 USC 2434 requires**

- An estimate of the personnel required to operate, maintain, support, and provide system-related training in advance of development, production and deployment

- **DODI 5000.02 requires**

- A manpower estimate at Milestones B, C, and full-rate production

- **DoD 5000.4M (Cost Analysis Guidance and Procedures) requires**

- A unit manpower document with supporting descriptions of the functions and relationships of the organizational elements
- A notional unit manpower document showing the relationships to the predecessor system if a unit manpower document is not available



Select image to enlarge.

Popup Text

Manpower Estimate Report

The Defense Acquisition Guidebook—or "DAG"—Chapter Three, Section 3.5 provides guidance on how to prepare one of these reports.

Manpower Estimate Report (MER), Cont.

The Manpower Estimate Report (MER) is the primary source of manpower quantities for O&S estimates at major decision milestones.

MER can usually be found in the Cost Analysis Requirements Description (CARD).

The key point is that early on in a program the MER won't be available.



Knowledge Review

As a PSM, you are getting ready for your program's Milestone B decision. In looking over the documentation, you note the absence of a manpower estimate. You draw this to the PM's attention, and he replies, "I don't think we need one this early in the program." You do some research and remind him, "Boss, _____ requires one." Which of the following policy documents did you cite?

- 10 USC 2434
- DoDI 5000.02
- DoD 5000.4M
- Cost Analysis Requirements Description

Check Answer

DpDI 5000.02 requires a manpower estimate at Milestones B, C, and full-rate production.

Typical Assumptions: Peacetime Manning

In estimating personnel costs, we have to estimate for peacetime based on wartime assumptions.

This essentially means that we estimate using the quantity of personnel that are included in the Manpower Estimate Report (manning needed for the unit to perform their wartime mission or their peacetime mission, whichever is larger).

We estimate the cost for these personnel using composite, or more fully burdened, rates based upon guidance from the Director, Cost Assessment and Program Evaluation (CAPE).

If costs are driven by operating hours, we estimate using peacetime operating hours.

Note: Document assumptions are in the Cost Analysis Requirements Descriptions (CARs), if one exists.



Typical Assumptions: Authorized Strength

We always work with "[Authorized Strength](#)".

Trying to estimate using assigned strength would prove difficult as assigned strengths vary.

For standardization purposes, CAPE guidance is to use authorized strength.

During peacetime or during certain operational cycles, a unit could well be understrength.

Also, missions change and with them the end-strength necessary to perform them.

When you are working 20-30 years in the future, you have no idea what the mission is going to be, so we default to the authorized strength.



Popup Text

Authorized Strength

The maximum number of sworn officers any given service agency is authorized to employ.

Typical Assumptions: Life Cycle Cost Estimate

For a Life Cycle Cost Estimate, you have to include all personnel and use at least the Composite Standard Rates for military and civilian. The chart below shows an example of annual costs associated with enlisted personnel, E1 through E9. **Select image to enlarge.**

AMCOS Version: Full Update Released September 8, 2011: FY 2012 Budget Materials, CY 2012 Pay Tables, FY 2010 Inventory

Element	E1	E2	E3	E4	E5	E6	E7	E8	E9
Avg Cost of All Separation Incentives	1,905	624	555	1,071	1,098	423	179	128	252
Avg Cost of Base Pay (Military)	17,891	20,054	21,382	25,795	31,738	38,600	47,746	56,136	70,380
Avg Cost of Basic Allowance for Housing (in cash)	11,889	12,113	12,645	13,111	14,378	17,436	18,810	20,243	21,866
Avg Cost of Basic Allowance for Subsistence	4,834	4,834	4,834	4,834	4,834	4,834	4,834	4,834	4,834
Avg Cost of Other Benefits	2,447	2,625	3,102	3,140	3,594	4,119	4,819	5,461	6,551
Avg Cost of Retired Pay Accrual	6,137	6,879	7,334	8,848	10,886	13,240	16,377	19,255	24,140
Avg Cost of Special Pays	1,166	1,186	1,277	1,526	1,860	2,176	2,346	2,427	2,707
Avg Permanent Change of Station-Annualized (f)	298	283	347	3,028	2,356	2,952	3,451	3,709	3,771
Total	\$46,565	\$48,597	\$51,475	\$61,353	\$70,744	\$83,779	\$98,562	\$112,193	\$134,501

Typical Assumptions: Economic Analysis

For Economic Analyses such as Business Case Analysis (BCA), Capabilities Based Assessment (CBA), Trade Studies, etc., there may be more flexibility.

You could only be required to discuss the change in personnel from the status quo, or use the marginal cost of personnel.

However, in some cases you are required to use the full cost to the Federal Government in the estimate which is well above the typical amount that needs to be budgeted.

Be sure to check with the Cost IPT to determine the guidelines for the study.



Knowledge Review

Using a chart of composite rates for military and civilians might indicate that you are conducting a _____.

- Economic Analysis
- Peacetime MER
- Life Cycle Cost Estimate
- Subsistence Analysis

Check Answer

For a **Life Cycle Cost Estimate**, you have to include all personnel and use at least the Composite Standard Rates for military and civilian.



Estimating Personnel Costs

To add to the complexity, we need to figure out how to come up with the right cost per human. You have to bear in mind that we have BOTH military and civilian personnel costs involved.

Let's examine military personnel costs first. This will include:

- Pricing Personnel Quantities
 - Using The Right Cost Per Person
- Estimating The Correct Quantity Of People
 - Manning assumptions may be "given" (MERs, etc.)

Personnel Qty_{type}



$$\text{Personnel Costs} = \sum_{\text{type}=1}^n (\text{Personnel Qty}_{\text{type}} * \text{Personnel Cost}_{\text{type}})$$

Long Description

This shows a formula for estimating personnel costs. It notes that personnel costs are equal to Personnel Quantity Type multiplied by Personnel Cost type which is then multiplied by the sum of the number of types.

Military Composite Standard Rates

"The composite standard pay rates will be used when determining the cost of military personnel for budget/management studies."

John Roth, Deputy Comptroller (Program/Budget), OUSD, 1 July 2009

The Annual Department of Defense (DoD) Composite Rate is calculated per guidance in the DoD Financial Management Regulation, Volume 11A, Chapter 6, Appendix I (DoD 7000.14R). [Dec 2008]

According to these statements, it is suggested to use the composite rate at a minimum. For Economic Analyses, the estimator has to add in all the costs to the Federal Government, which can be extensive for military personnel.

The composite rates do not always give an accurate or complete picture. This is why in-depth knowledge of the system and its employment is critical. But early in acquisition, sometimes that knowledge just doesn't exist.

Note: "DoD Composite rates do not account for the full cost of military or DoD civilian personnel. ... Composite rates should not be the only source of data..." *DTM 09-007, CAPE Directive*

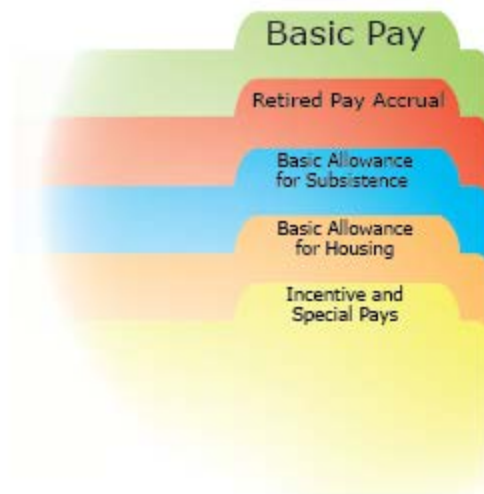


Composite Standard Rate Components: Active Military

For active duty military, the composite rate is made of these eight elements.

They are derived from the DoD FMR Volume 11A, Chapter 6, Appendix I.

1. Basic Pay
2. Retired Pay Accrual
3. Basic Allowance for Subsistence
4. Basic Allowance for Housing
5. Incentive and Special Pays
6. Permanent Change of Station
7. Miscellaneous Pay
8. Medicare-Eligible Retiree Health Care Accrual



Deviating From Composite Averages

Simply using the Composite Standard Rates may not give us an accurate picture of projected personnel costs.

- Composite Standard Rates are Service-wide averages:
 - All specialties are averaged together
 - Pilots, doctors, submariners, etc. with others

Do service-wide averages apply to every O&S estimate and trade analysis?

It is necessary to adjust the service wide averages in order to deal with special circumstances of a particular acquisition.

So, the answer to the question posed is clearly, "No."



Grade Distributions

Since we don't always have detailed information on the make up of forces, what do you do when taking into account the difference in pay between officers of different grades?

This list shows some possible options.

- Choose a comparable unit and use its grade distribution, mean, median or mode
- Create your own weighted average
 - From service-wide grade distribution
 - From a comparable unit
 - Army Tables of Organization and Equipment (TO&Es)
 - Marine
 - Navy
 - Air Force



Does Specialty Matter?

Personnel specialties can have a significant impact on O&S cost. The chart below, taken from the Navy's "Meteor" model, shows just training costs as an example. Note that the training costs for a submariner are over twice as much as for the average person in the Navy. If that extra training cost needs to be captured, then an adjustment will need to be made. Just as special training drives activities in sustainment planning, so does special training potentially drive additional O&S cost.

Direct costs differ	- due to specialty and incentive pays
Indirect costs differ significantly	- due to replacement training

	Generic E-6	E-6 submarine electronics technician	Generic O-3	Submarine O-3	Aviation O-3
Direct Cost	53778	56591	73618	83048	73585
Recruiting	745	745	1,065	1,065	1,065
Training	16,604	43,470	31,908	56,167	81,523
Base Operating Support	8,316	8,316	8,828	8,828	8,828
Medical	2,993	2,993	2,873	2,873	2,873
Administrative Activities	171	171	171	171	171
Individuals Account	4,674	4,674	7,124	7,124	7,124
Indirect Variable Cost	33,503	60,369	51,969	76,228	101,584
Total Variable Cost	87,281	116,960	125,587	159,276	175,170

Costs Of Reserve Personnel

Reserve personnel work a fraction of the time that active duty personnel work, unless they are activated and deployed, in which case, the Composite Standard Rates apply.

For most cost estimates, they are treated on a pro-rata basis of their active duty counterpart.

The main takeaway here is that reserve personnel are not all alike.

The number of drills that they attend varies by the type of unit they are in and the individual.

For example, individuals have an incentive to get credit for fifty drill days per year.

You have to work with the individual Service to determine what is the best average to use for estimating purposes.



Costs Of Reserve Personnel, Cont.

The two major categories of Reserve Personnel are:

- Fulltime personnel
 - Use Active Composite Standard Rates - less PCS costs or component provided data
- Drill personnel
 - 24 Drill (1 day per month and 2 weeks annual training)
 - 48 Drill (2 days per month and 2 weeks annual training)
 - Some units (i.e., aviation) have other standard practices (more days than either 24 or 48 Drill)
 - Some military reservists also serve as civilian technicians

Drill Personnel	Weekend Days/Year	Drill Credits/year	Annual Drill Days
24 Drill	12	24	12
48 Drill	24	48	12

Composite Rates For Civilians

Estimating civilian personnel cost is much less complex than for military. Everything on the list below, other than Basic pay, is calculated as a percentage of Basic pay. Calculations are simple. That said, we still need to accurately reflect the numbers of civilian personnel.

- Basic Pay
- Overtime, holiday, night differentials, incentive awards and all other personnel compensation above basic rates paid directly to civilian employees.
- Government costs for civilian benefits, such as:
 - Retirement
 - Health benefits
 - Life insurance
 - Quarters or uniform allowances



Using Indirect Personnel Costs

While the memo quoted below is from 1997, the issue has by no means gone away and is not unique to the Navy. As it indicates, this issue is important not only in developing O&S cost estimates, but also in estimating personnel costs when conducting trade studies. Obviously, distorting the personnel costs can significantly change the outcome of trade study analyses.

In an August, 1997 memo to the Navy Acquisition Community, Rear Admiral (RADM) Sullivan wrote:

"The exclusion of (variable) indirect personnel costs has underestimated manpower costs and distorted the results of tradeoffs between personnel costs and investment in new technologies.

It is important that we use more accurate personnel cost estimating rates for intra-Navy tradeoffs and analyses.

I thus request that you employ METEOR (values)...for all future intra-Navy analytical purposes. Cost estimates forwarded to organizations outside the Navy should continue to use only direct manpower cost rates."



Knowledge Review

You are discussing Composite Rates with your cost estimator and are trying to understand what elements are common to both military and civilian personnel Composite Rates. The estimator responds:
(Select all that apply)

Retirement Pay

Incentives

Life Insurance

Basic Pay

Check Answer



Retirement pay, incentives, and basic pay are all components of the composite rates for both military and civilian personnel. Life Insurance is only part of the civilian composite component.

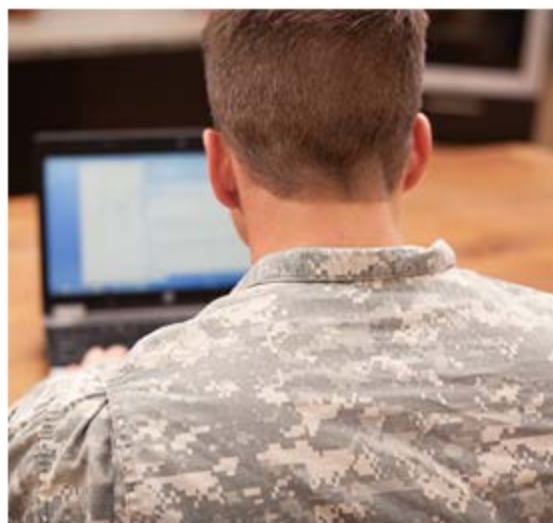
Manpower Analysis

There is frequently considerable uncertainty surrounding staffing estimates.

We frequently look at historical information which may or may not be completely analogous and it's critical that we adjust for differences.

So, it is imperative that the PSM be intimately familiar with the operating concepts of the system in question. Program-unique circumstances will drive changes to historical precedents.

Let's take a look at some of the reasons for the uncertainty.



Manpower Analysis, Cont.

Staffing assumptions:

- Program requirements often target staffing reductions
- Program offices set aggressive staffing goals
- Staffing is ultimately set by users

Independent O&S cost estimates put more weight on precedents than targets:

- Rely heavily on staffing of analogous systems/units
- Adjust for changes
 - System characteristics (especially R&M)
 - Operating concepts
 - Support concepts



Peacetime Costs and Wartime Requirements

There are unique aspects related to the individual service, type of system, Concept of Operations, and a host of other variables that must be considered in arriving at a credible estimate.

Military manning is based on wartime requirements.

The expected wartime Operational Tempo (including surge periods and post surge recovery) affects crew, maintenance, and support personnel staffing.



Long Description

Collage of file folders/schematics, man in thought and military jet in flight.

Peacetime Costs and Wartime Requirements, Cont.

Additional nuances related to manpower estimates include:

- Relationships among wartime operating tempos, operating crews, maintenance personnel, and support staff are complex
- Crews may perform operating, maintenance and unit staff functions or perform only operator roles
 - Navy Ships: personnel are both operators and maintainers
 - Tracked and wheeled vehicles: operator performs some maintenance tasks with support from centralized repair activities
 - Most aircraft: crew and maintenance functions are predominantly separate activities



O&S costs reflect peacetime costs which include:

- Expected budgetary requirements
- O&S personnel costs based on peacetime manning

Factors Affecting Wartime: Operational Tempo (OPTEMPO)

Trying to predict manpower requirements based on Operational Tempo (OPTEMPO) can be a difficult process.

We have seen over the past few years that initial assumptions about OPTEMPO are often considerably off the mark when real-world wartime situations arise.

For example, initial assumptions about the number of scheduled operational events per day and the duration of operational events can be well off the mark.



Operating And Support Effects

We mentioned earlier the necessity of considering both scheduled and unscheduled maintenance. These can require significant manpower.

In wartime, non-critical maintenance is frequently deferred, as well as most other aspects of cost and sustainment. However, important questions must be asked such as:

- How long do you defer in high surge periods?
- How does this affect personnel costs?



Operating And Support Effects, Cont.

Finally, indirect manpower costs can often be difficult to calculate, but they are real and must be included.

Indirect Manpower costs include:

- Weapons buildup requirements
- Overhead requirements
 - supervision
 - maintenance management, etc.



Sources Of Typical Unit Manning Data

Here are some of the most common sources of manning data for the Services.

Army

- Forces database

Navy

- [Manpower Cost Estimating Tool for Enhanced Online Reporting \(METEOR\)](#) System Manning Document templates
 - By grade, specialty, and department for selected ships
- [Navy VAMOSC](#)
 - Officer and enlisted totals by ship class and MDS

Marine Corps

- [Marine Corps Doctrine](#)

Air Force

- [AFI 65-503 Tables A42-1, A43-1, A44-1](#)
 - Selected squadrons
 - Air Force portal



Knowledge Review

As the PSM, in explaining to your team the difficulties in predicting military manning and therefore personnel costs, you note that this may occur because _____.

(Select all that apply)

- OPTEMPO rarely allows for reliable numbers
- Personnel may perform multiple tasks during peacetime
- Indirect costs, such as weapons buildup requirements must also be included
- Personnel might switch from one branch of military to another

Check Answer

In explaining to your team the difficulties in predicting military manning and therefore personnel costs, you note that this may occur because **OPTEMPO rarely allows for reliable numbers, personnel may perform multiple tasks during peacetime and indirect costs, such as weapons buildup requirements must also be included.** It is not typical for personnel to switch branches.



Lesson Summary

To summarize, in this lesson you learned the following:

- Calculating the cost of personnel is relatively straightforward. But there are subtleties in determining both quantities and *indirect personnel* costs that have to be explored. As a PSM, you need to consider the cost of personnel as well as the quantity.
- Manpower Estimate Reports (MER) are the primary source of manpower quantities for O&S estimates at major decision milestones. MER can usually be found in the Cost Analysis Requirements Description (CARD).
- In estimating personnel costs, we have to abide by a convention that says that we have to estimate for peacetime based on wartime assumptions. We estimate the cost for these personnel using composite rates based upon guidance from the Director, Cost Assessment and Program Evaluation (CAPE). If costs are driven by operating hours, we estimate using peacetime operating hours.



Lesson Summary, Cont.

- A PSM needs to be aware of the appropriate composite rate for costing military or civilian personnel.
- Indirect personnel and manpower costs, such as weapons buildup and maintenance, may be difficult to calculate but they must be included.



Lesson Summary, Cont.

Congratulations! Now that you have completed the Personnel Costs lesson, you should be able to:

1. Identify where personnel costs occur in O&S estimates.
2. Describe the general assumptions that affect personnel cost estimates.
3. Explain how to price personnel.
4. Identify major sources of personnel cost data.
5. Explain the role of the Manpower Estimate Report.



Lesson Completion

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