Civil Service Workforce Market Supply and the Effect on Cost Estimating Relationships (CERs) that may effect the Productivity Factors for Future NASA Missions

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Abstract

The upcoming retirement of the Baby Boomers on the horizon will leave a performance gap between younger generation (the future NASA decision makers) and the gray beards. This paper will reflect on the average age of workforce across NASA Centers, the Aerospace Industry and other Government Agencies, like DoD. This papers will dig into Productivity and Realization Factors and how they get applied to bi-monthly (payroll data) for true FTE calculations ~ that could be used at each of the NASA Centers and other business systems that are on the forefront in being implemented. This paper offers some comparative costs solutions, from simple - full time equivalent (FTE) cost estimating relationships CERs, to complex - CERs for monthly time-phasing activities for small research projects that start and get completed within a government fiscal year. This paper will present the results of a parametric study investigating the cost-effectiveness of different alternatives performance based cost estimating relationships (CERs) and how they get applied into the Center's forward pricing rate proposals (FPRP). True CERs based on the relationship of a younger aged workforce will have some effects on labor rates used in both commercial cost models and internal home-grown cost models which may impact the productivity factors for future NASA missions.

Presentation Outline

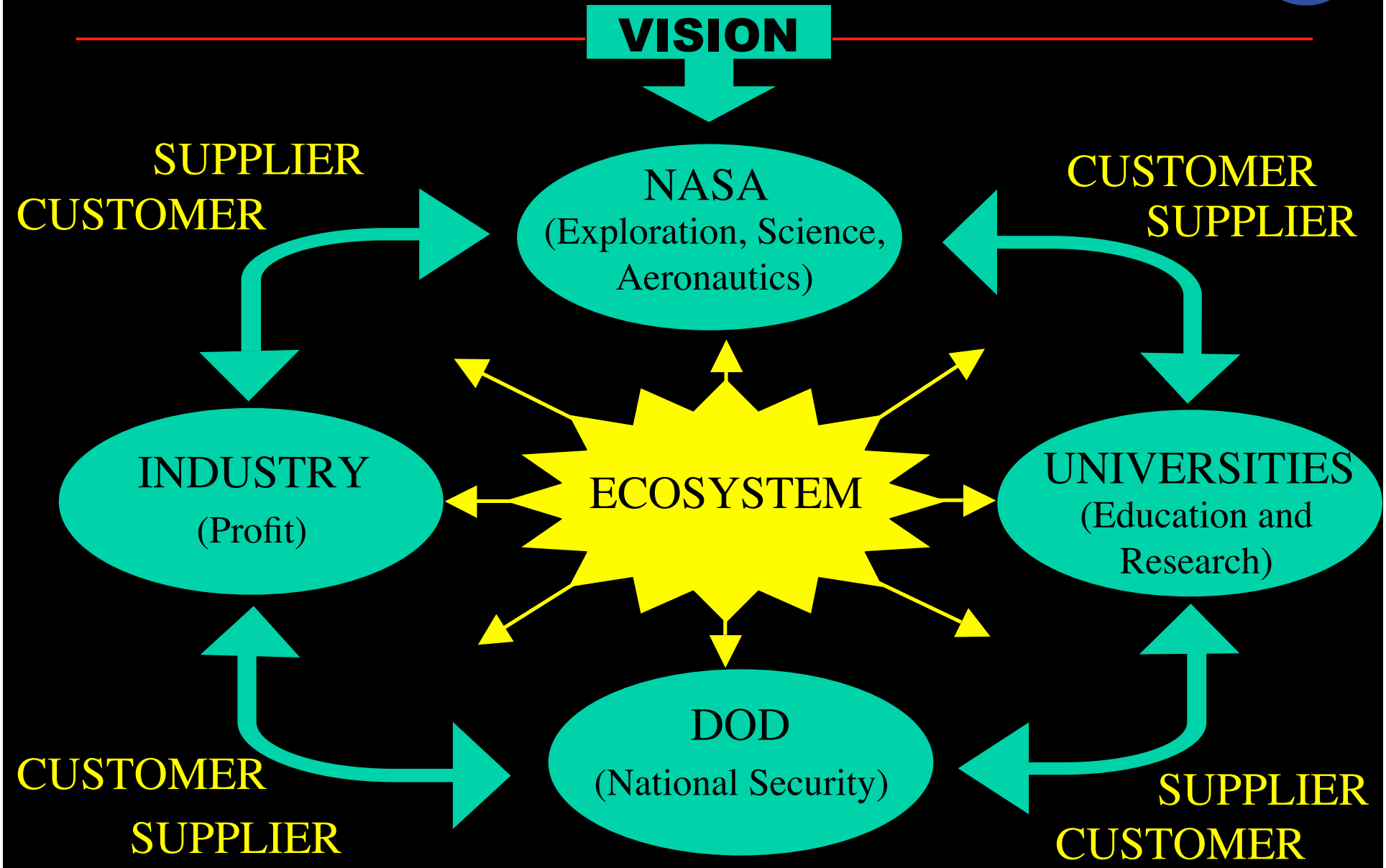
- The Health of the Agency ~ as a whole
- Baby Boomers on the Horizon . . .
- Average Age at NASA Centers
- Productivity & Realization Factors Examined
- How the P-Factor & R-Factor gets derived from Payroll Data?
- How to develop CERs based on the P-Factor
  - By Organization / Branch
  - By Mission Directorate / Project
- How to develop Forward Pricing Rates Proposal
- Best Practices and "Standards"
- Gray Beards vs the younger age workforce
- Summary / Conclusion

Health of the Agency as a Whole

- **The Goldilocks Syndrome**
  - **NASA Centers:** "We need more people"
  - **Others:** "You need less people, you need to outsource more work"
  - **NASA Administrator:** The Agency is about the "right size", we need to recapture in-house intellectual capability.

- **3 Options above are too general**
  - Work needs to be planned at the task level
  - Work is not going to where the workers are (skill mix) issues at some centers.
  - NASA workforce is ageing, need to hire fresh-outs and implement a long-term strategy and other means to ensure an effective aerospace workforce ecosystem.

Aerospace Workforce Ecosystem



Health of the Agency as of Today

- **Current Headcount: 18,520**
- **Current Average Age: 46.4**
- **Current Yrs of Fed Svc: 17.9**
- **Current Average CS Grade: 12.9**

Time Period	Average Age	Avg Years of Federal Svc	Average GS grade	CS Head Count
Start of FY1998	43.7	16.7	12.1	20,238
Start of FY1999	44.0	16.8	12.2	19,272
Start of FY2000	44.5	17.2	12.3	18,981
Start of FY2001	44.5	17.3	12.3	18,872
Start of FY2002	44.8	17.4	12.3	19,073
Start of FY2003	45.3	17.8	12.5	18,999
Start of FY2004	45.6	17.9	12.5	19,097
Start of FY2005	45.8	17.8	12.6	19,388
Start of FY2006	45.8	17.7	12.7	18,737
Start of FY2007	46.1	17.8	12.8	18,527
Start of FY2008	46.4	17.9	12.9	18,520

As of October 1st, 2007

Health of the Agency as of Today

- NASA's total CS population has declined by 9.3% over the past 10 years, yet Term Appointments have increased by 333%

CS Head Count	Full-Time Permanent	Part-Time Permanent	Term Appointment	Student	Other Non-Permanent	All Employees
Start of FY1998	18,853	173	318	513	381	20,238
Start of FY1999	17,754	171	493	478	376	19,272
Start of FY2000	17,741	208	228	504	300	18,981
Start of FY2001	17,857	207	193	550	65	18,872
Start of FY2002	17,966	197	222	610	78	19,073
Start of FY2003	18,000	197	182	553	67	18,999
Start of FY2004	17,951	198	280	579	89	19,097
Start of FY2005	17,783	185	649	585	186	19,388
Start of FY2006	16,795	166	1,086	533	157	18,737
Start of FY2007	16,558	146	1,200	496	127	18,527
Start of FY2008	16,430	133	1,377	486	94	18,520

Health of the Agency as of Today

- NASA is relying on more term and Other-Than-Full-Time Permanent (OTFTP) employees

CS Head Count as % of row total	Full-Time Permanent	Part-Time Permanent	Term Appointment	Student	Other Non-Permanent	All Employees
Start of FY1998	93.16%	0.85%	1.57%	2.53%	1.88%	100.00%
Start of FY1999	92.12%	0.89%	2.56%	2.48%	1.95%	100.00%
Start of FY2000	93.47%	1.10%	1.20%	2.66%	1.58%	100.00%
Start of FY2001	94.62%	1.10%	1.02%	2.91%	0.34%	100.00%
Start of FY2002	94.20%	1.03%	1.16%	3.20%	0.41%	100.00%
Start of FY2003	94.74%	1.04%	0.96%	2.91%	0.35%	100.00%
Start of FY2004	94.00%	1.04%	1.47%	3.03%	0.47%	100.00%
Start of FY2005	91.72%	0.95%	3.35%	3.02%	0.96%	100.00%
Start of FY2006	89.64%	0.89%	5.80%	2.84%	0.84%	100.00%
Start of FY2007	89.37%	0.79%	6.48%	2.68%	0.69%	100.00%
Start of FY2008	88.71%	0.72%	7.44%	2.62%	0.51%	100.00%

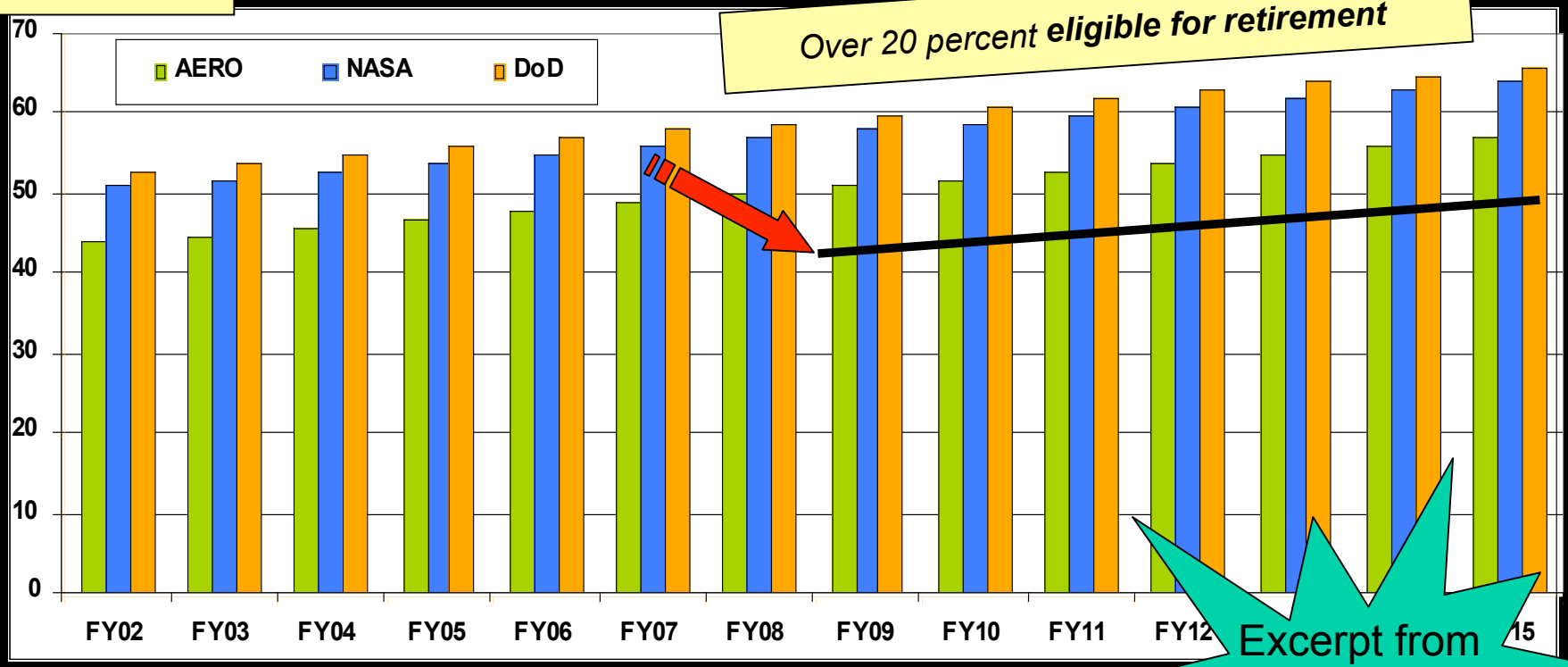
Health of the Agency as of Today

- NASA's CS workforce is better educated than 10 years ago and continues to trend towards more educated CS employees

CS Head Count as % of row total	Doctorate Degree	Master's Degree	Master's Equivalent	Bachelor's Degree	Associate Degree	No Degree	Unspecified	All Degrees
Start of FY1998	9.31%	20.94%	1.14%	40.14%	5.92%	22.55%	0.00%	100.00%
Start of FY1999	9.81%	21.14%	1.17%	39.92%	5.97%	22.00%	0.00%	100.00%
Start of FY2000	10.17%	21.88%	1.24%	38.91%	5.96%	21.84%	0.00%	100.00%
Start of FY2001	9.93%	22.21%	1.07%	39.27%	5.98%	21.55%	0.00%	100.00%
Start of FY2002	10.30%	22.66%	1.02%	39.29%	5.86%	20.88%	0.00%	100.00%
Start of FY2003	10.48%	22.94%	1.05%	39.57%	5.78%	20.19%	0.00%	100.00%
Start of FY2004	10.60%	23.17%	1.02%	39.78%	5.65%	19.78%	0.00%	100.00%
Start of FY2005	10.60%	23.52%	0.96%	40.47%	5.76%	17.84%	0.85%	100.00%
Start of FY2006	10.83%	24.52%	1.01%	41.02%	5.31%	17.00%	0.30%	100.00%
Start of FY2007	10.83%	25.83%	1.01%	40.92%	5.08%	16.21%	0.12%	100.00%
Start of FY2008	10.87%	26.56%	1.01%	40.86%	5.00%	15.51%	0.18%	100.00%

Baby Boomers on the Horizon

Average age



*Over 20 percent **eligible for retirement***

The average age of the aerospace worker in industry is 44. The average age is 46.4 at NASA and 53 in the DoD.
1 Over 26 percent of the aerospace workforce will be eligible for retirement in 2008 (CFUSAI, 2002).

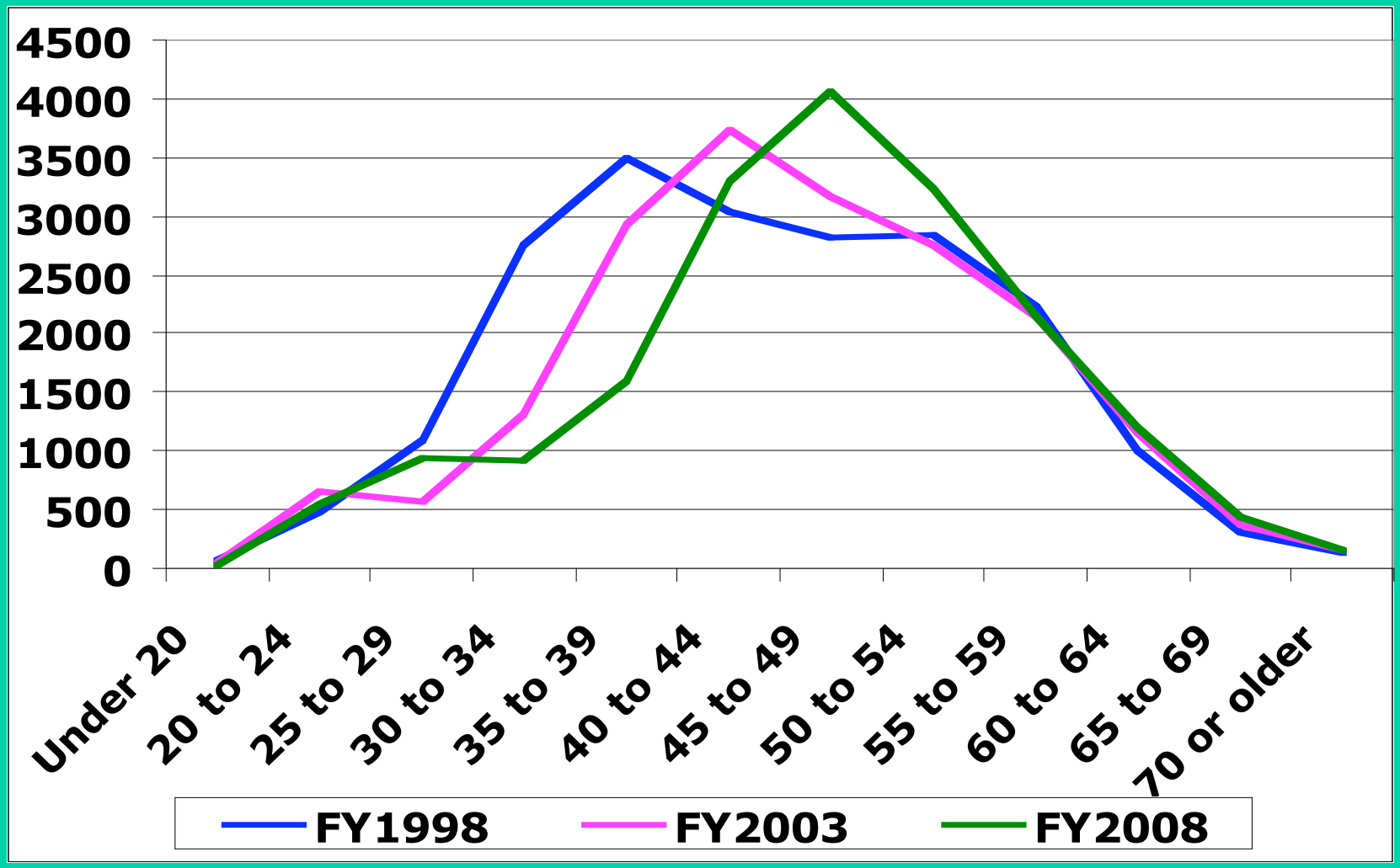
Excerpt from Steve's White Paper Ref N2 Shuttle

Average Age at NASA Centers

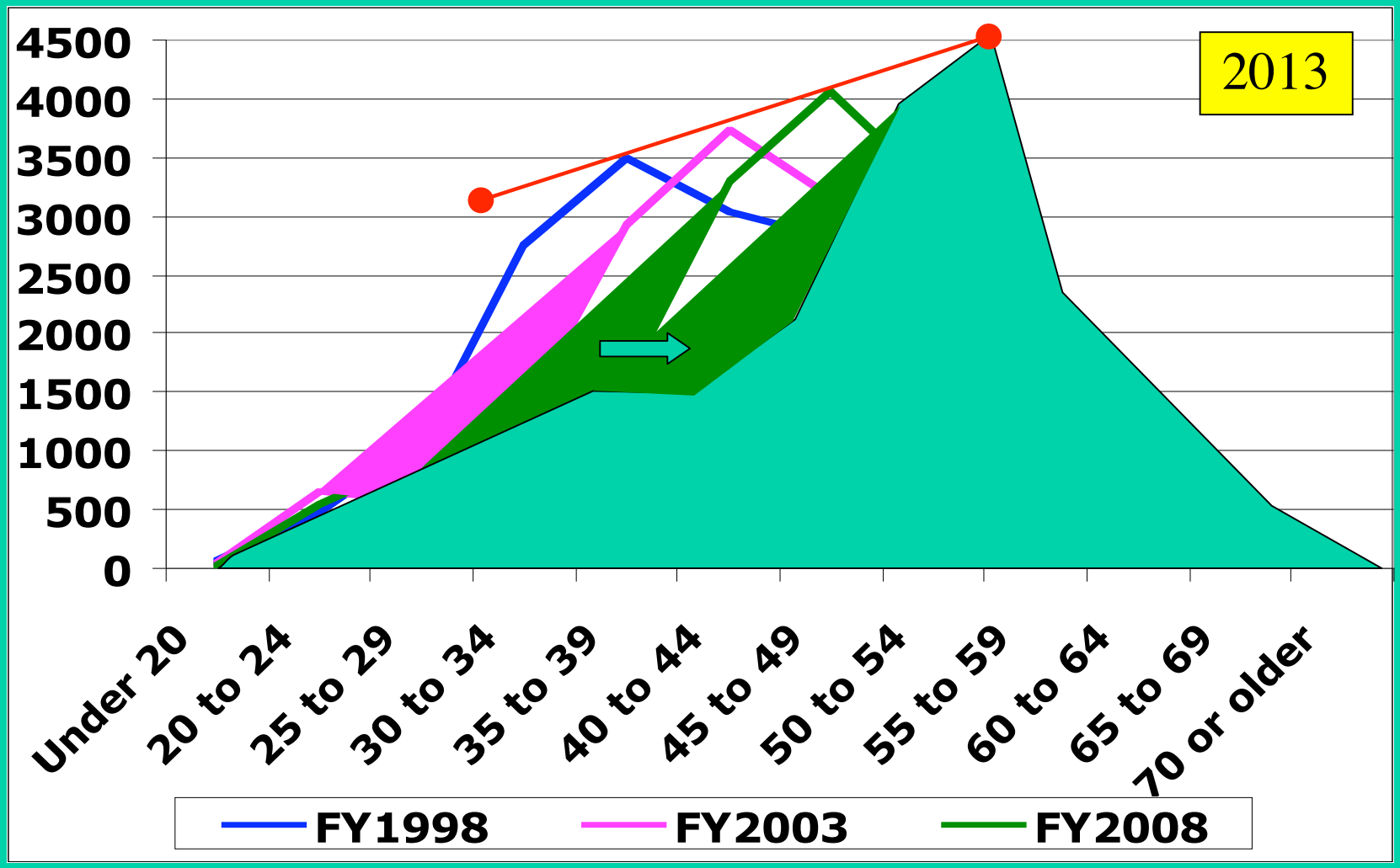
- The age group with the highest percentage of CS employees continues to rise
- NASA's over the age "65" population now comprises over 3% of NASA's workforce

CS Head Count as % of row total	Under 20	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69
Start of FY1998	0.34%	2.34%	5.44%	13.55%	17.32%	15.00%	13.90%	14.02%	10.96%	5.01%	1.47%
Start of FY1999	0.31%	2.23%	4.31%	12.45%	18.14%	15.88%	14.62%	13.85%	10.94%	5.20%	1.44%
Start of FY2000	0.36%	2.37%	3.30%	11.04%	18.25%	16.75%	14.96%	14.12%	11.00%	5.54%	1.63%
Start of FY2001	0.47%	2.85%	3.21%	9.44%	17.90%	17.87%	15.76%	14.17%	10.46%	5.58%	1.65%
Start of FY2002	0.37%	3.47%	3.05%	8.03%	16.81%	19.03%	15.84%	14.69%	10.58%	5.65%	1.74%
Start of FY2003	0.24%	3.41%	3.02%	6.93%	15.46%	19.62%	16.70%	14.46%	11.26%	6.09%	2.01%
Start of FY2004	0.36%	3.45%	3.41%	5.68%	13.97%	20.14%	17.22%	14.82%	11.37%	6.45%	2.29%
Start of FY2005	0.26%	3.65%	4.01%	5.05%	12.80%	20.16%	17.99%	15.02%	11.39%	6.32%	2.41%
Start of FY2006	0.19%	3.62%	4.35%	4.92%	11.27%	20.02%	19.54%	15.84%	11.33%	5.94%	2.11%
Start of FY2007	0.16%	3.05%	4.92%	4.65%	9.87%	19.12%	21.14%	16.26%	11.71%	6.10%	2.17%
Start of FY2008	0.16%	2.92%	5.03%	4.90%	8.63%	17.77%	21.91%	17.49%	11.52%	6.48%	2.33%

Baby Boomers on the Horizon (cont)



Baby Boomers on the Horizon (cont)



Baby Boomers on the Horizon (cont)

- **How does a Cost Estimator determine good CERs for Workforce Planning?**
- **One method is to continue to monitor the "productivity factor" at the Center.**
- **A "Lower Productivity" Factor may indicate the following:**
  - Low Moral
  - High Annual and Sick Leave
  - High number of older aged workforce
- **A "High Productivity" Factor may indicate the following:**
  - An energized workforce
  - a younger aged workforce
- **Would a Trend Analysis on Baby Boomers reflect / correlate to lower/higher Productivity Factor?**

Productivity & Realization Factors - Defined

- **Productivity Labor Factor**
  - A measure of economic efficiency "services" that show a direct impact to the vision and mission of the agency. Productivity is measured by hours worked divided by the total number of hours available throughout the work year. (The standard business formula is ~ 12 holidays, 10 vacation days, and 8 absent personal days) Therefore the total productive hours are 1840 hours. 1840 / 2080 = 88.5%

- **Realization Labor Factor**
  - A measure of economic inefficiency. Realization is the summation of total "Leave Hours" divided by the total "Productive Hours". The percentage is applied back to direct work hours to achieve a full time equivalent (FTE). An Example: 240 / 1840 = 13% 1.13 * 1840 = 2080

Productivity & Realization Factors Examined (Cont)

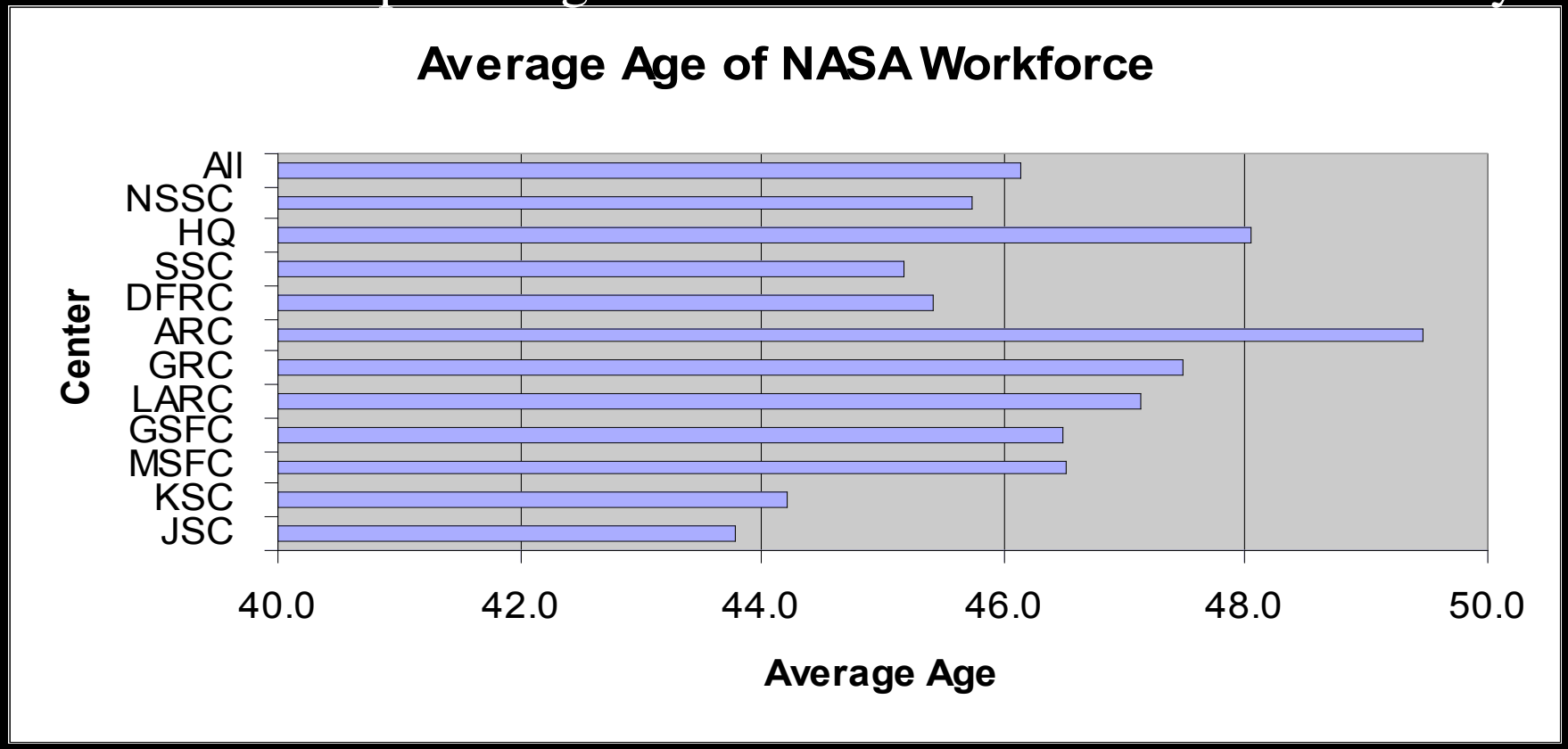
- Why do we need to understand the above factors?

1. Productivity is a common measure that is used through-out the Aerospace Industry. The "P-Factor" is the KEY element in developing good Cost Estimating Relationships (CERs) for estimating LABOR. The other element is the "learning curve" or "O-give Curve".

2. Realization or "R-Factor" gets applied to Direct Labor actuals. It encompasses the labor overhead to the forward pricing rates. Forward pricing rates proposals and agreements (FPRP) and (FPRA) are established each year and get updated when needed. FPRA could also be called "Billing Rates" for Reimbursable and other transactions.

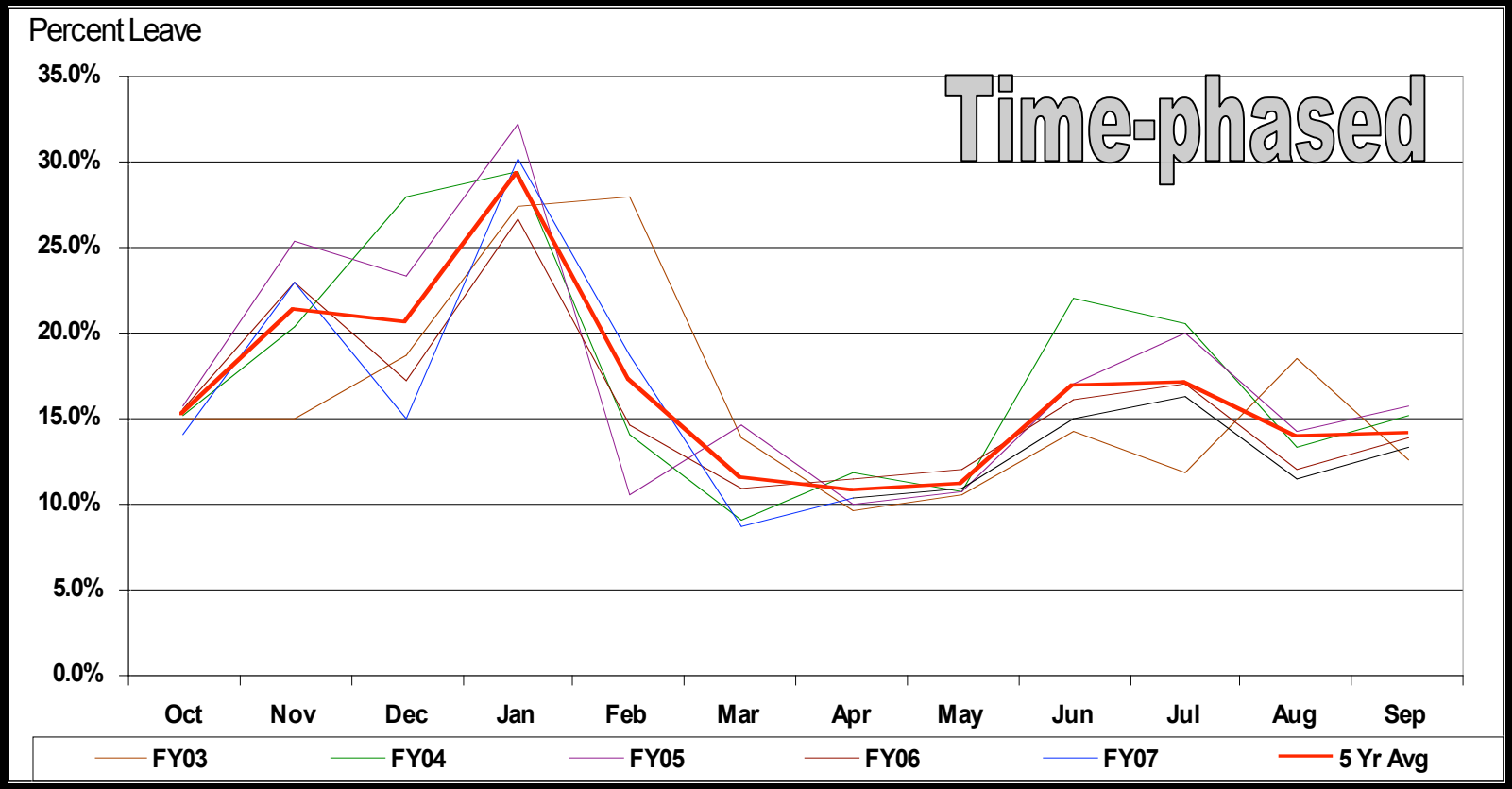
Average Age at NASA Centers

•On average, NASA's Research Centers have older CS employees than NASA's Space Flight Centers. JPL not included in the study.



Average Age as values	JSC	KSC	MSFC	GSFC	LARC	GRC	ARC	DFRC	SSC	HQ	NSSC	All Centers
Start of FY2008	43.8	44.2	46.5	46.5	47.1	47.5	49.5	45.4	45.2	48.0	45.7	46.4

A Typical NASA Center - Leave Study
Five Year "Leave" Analysis



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year	Productive Hours
FY03	15.0%	15.0%	18.8%	27.4%	27.9%	13.9%	9.7%	10.6%	14.3%	11.9%	18.6%	12.6%	16.3%	1740
FY04	15.2%	20.4%	28.0%	29.6%	14.2%	9.2%	12.0%	10.9%	22.1%	20.5%	13.4%	15.2%	17.6%	1714
FY05	15.8%	25.3%	23.4%	32.3%	10.6%	14.7%	10.1%	10.8%	17.1%	20.0%	14.3%	15.7%	17.7%	1712
FY06	15.5%	23.0%	17.2%	26.8%	14.7%	10.9%	11.5%	12.1%	16.1%	17.1%	12.1%	13.9%	15.9%	1749
FY07	14.1%	23.0%	15.1%	30.2%	18.8%	8.8%	*10%*	*11%*	*15%*	*16%*	*11%*	*13%*	*16.1%*	*1745*

How does P-Factor & R-Factor get derived from Payroll Data ?

WebTADS WBS Report Generated at 10/01/2007 - with Transactions as of 09/29/2007 For FY07 Since 10/01/2006
Roll Up at Employee Level

WBS	Org Assigned	Route Code	Last Name	First Name	Regular	Overtime	Leave	Paid Leave	Non-paid Leave	Earned	Comp-time Used
014368.09.02.99	DFRC	DFRC	STERK	STEVE			112.00	152.00			
422335.10.03	DFRC	DFRC	STERK	STEVE	604.00						
599489.02.07.02.0	DFRC	DFRC	STERK	STEVE	300.00		16.00	16.00			16.00
984754.02.07.02.1	DFRC	DFRC	STERK	STEVE	600.00						
984754.02.07.02.1	DFRC	DFRC	STERK	STEVE	400.00		8.00	8.00		8.00	8.00
Total CUM Hours					1904.00	0.00	136.00	176.00	0.00	8.00	24.00

FOR THIS EXAMPLE;

- **Productivity or "P-Factor" is 92%**
  - Add "Regular Hours" plus "Paid Leave Hours"
  - 1904 plus 176 equals 2080
  - 1904 divided by 2080 equals 0.9154
- **Realization or "R-Factor" is 9%**
  - Divide "Paid Leave Hours" by "Regular Hours"
  - 176 divided by 1904 equals .0924

or divide by the pay-roll period or accounting hours

Foot Note

Check the "Official" Accounting Calendar for out year planning

How does P-Factor & R-Factor get derived from Payroll Data ?

- The following "P-Factor Table" by NASA Centers was artificially generated due to SBU data ~ but is used in this presentation as an example to correlate "Age" with "Productivity".

	Productivity Table	ARC	DFRC	GRC	GSFC	HQ	JPL	JSC	KSC	LaRC	MSFC	NSSC	SSC
1	Regular Hours Worked (Expressed in Thousands of Hours)	1,937	926	2,675	5,271	2,065	7,938	5,831	3,696	3,143	4,254	175	456
2	Paid Leave Hours (Expressed in Thousands of Hours)	601	187	688	1,216	558	2,462	929	628	775	982	37	89
3	Total Hours GFY 2007 (Expressed in Thousands of Hours)	2,538	1,113	3,363	6,488	2,623	10,400	6,760	4,324	3,919	5,235	212	545
4	** *Productivity Percentage or "P-Factor"*	*76%*	*83%*	*80%*	*81%*	*79%*	*76%*	*86%*	*85%*	*80%*	*81%*	*83%*	*84%*
5	** *Realization Percentage or "R-Factor"*	*31%*	*20%*	*26%*	*23%*	*27%*	*31%*	*16%*	*17%*	*25%*	*23%*	*21%*	*20%*
6	CS FTE GFY 2007	1,220	535	1,617	3,119	1,261	5,000	3,250	2,079	1,884	2,517	102	262
7	Average Age CS FTE	49.5	45.4	47.5	46.5	48.0	* 49.5	43.8	44.2	47.1	46.5	45.7	45.2
8	On-Site Contractactors		490.0										
9	Average Age WYE (Cnt'r)		42.0										

Data Unavailable

* Estimated Average Age of Workforce

** Estimated Calculation "true data or P-Factors" must be pulled from "Offical Source" then calculated

How to develop CERs, FPRP, and FPRA based on the P-Factor

- **10 Step Approach**

  Step 1 – Determine if the Forward Pricing Rates will be by Branch or by a specific Project Type ?

  In this case or example will be by Branch

  Step 2 – Pull "Actuals" Labor Rates by Branch from Labor Pricing Module (WIMS or LPM)

  Step 3 – Divide the actuals Cost by the number of CS FTE

  To get an "Average Rate by Branch"

  Things to look out for: Temporary Employees, Co-Ops, College Hires, etc.

  Step 4 – Determine the Employee Fringe Benefit (EFB)

  Currently ~ I believe the agency is using a percentage like 24.45 %

  LPM may have accurate Employee Fringe Rates by Branch

  Step 5 – Add or multiply the Direct Labor Rate "Plus" the EFB

Direct Labor	Plus	EFB	Equal	Direct Labor "Burdened"
$90,000	Plus	$22,005	Equal	$112,005

How to develop CERs, FPRP, and FPRA based on the P-Factor (Con't)

- **10 Step Approach - Continued**

Direct Labor	Plus	EFB	Equal	Direct Labor "Burdened"
$90,000	Times	24.45%	Equal	$112,005

Step 6 - $112,005 is the Average Salary Yearly Rate ~ but we are developing our FPRP, FPRA, or Billing Rates in Hours

SO WHAT DO WE DO . . . . . ?

Step 7 – Multiply the P-Factor 83% (look at prior table) multiply the number of total hours from the "Official" Accounting Calendar i.e. 2080. The results is 1,731 Hours

Step 8 – Divide "Direct Labor Burdened Salary" by 1731 or P-Factor

The results is $64.71 per hour for the "Program Year" (PY)

Caution ~ you may want to add an inflation or ogive rate depending on the (time-period) as to when you pulled your "Actuals".

Step 9 - Multiply the appropriate inflation rates for out year planning for Civil Service Salary are provided in the annual SPG.

How to develop CERs, FPRP, and FPRA based on the P-Factor (Con't)

- **10 Step Approach - Continued**

  Step 10 - Sanity Check

  Stop and think through all possible scenarios . . .

  A.) Salary Rate Increases are normally the 2nd Quarter ~ about 3%

  B.) How many promotions are in-line for the Branch . . . ?

  About 1.4% is a good rule of thumb for a given year

  C.) How many CS FTE will Retire in a given year . . . ?

  Remember the Baby Boomer's Syndrome

  A higher than normal retirement number will decrease the out year rate

  D.) What is the general feel for the Branch . . . ?

  Is there a foreseeable growth within the Branch . . . ?

  or is the technology on the way out or in transition . . .?

  E. Other unknowns-knows or unforeseeable events . . . ?

  F.) Can the Forward Pricing Rates pass the Sanity Check or a Peer Review or be defensible by the new Government Auditing Organization (GAO) Cost Assessment Guide . . .?

How to develop CERs, FPRP, and FPRA based on the P-Factor (Con't)

- **By Mission Directorate / Project**
  - Use the same approach addressed earlier, however be advised to use extreme caution when developing CER's by Project.
- **WHY?**
  - Program / Project CERs have a "Life Cycle Cost" (LCC) meaning; work that is performed at the beginning of the program (example: Planning) is not the same workforce at the middle nor the end. The most important reason for differentiating between recurring and nonrecurring costs is in their application to learning curves. Simply put, learning curve theory applies only to recurring costs. Cost improvement or learning is generally associated with repetitive actions Therefore labor rates on a Program / Project are generally more subjective to change (year by year) than by Branch.

Best Practices & Standards

- **There is a need for "Standards" either ANSI or ISO to help bridge the GAP between Cost Estimation & EVM.**

- **GAO has developed the *Cost Assessment Guide* in order to establish a consistent methodology based on best practices to be used across the federal government for the development and management of its program cost estimates.**
  - The preliminary "exposure draft" currently reflects 20 chapter documents, 323 pages. Highlights includes: Cost Estimators' Check List, backed-up with case studies, graphs and tables.
  - The purpose of the Guide . . .
    1. is to address the generally accepted best practices for ensuring credible program cost estimates.
    2. provide a detailed link between cost estimating and earned value management.

Cost Estimator's Check List
"GAO's - Exposure Draft dated 7/4/07"

- ☑ The documentation should describe the cost estimating process, data sources, and methodologies in a step-by-step fashion so that a cost analyst unfamiliar with the program could understand what had been done and replicate the estimate.
- ☑ There should be adequate supporting data included in the documentation so that the estimate can be easily updated to reflect actual costs and / or program changes and the resulting data can be used as a basis for future estimates.
- ☑ The documentation should include both narrative text and cost tables to describe the basis of the estimate.
- ☑ Documentation should follow a standard format including an executive summary, introduction, cost estimate methodology and data broken out by WBS cost elements, sensitivity analysis, risk/uncertainty analysis, management approval, and updates to reflect actual costs and changes
- ☑ Documentation should make sense, both mathematically and logically.
- ☑ The documentation should include a discussion of contingency reserve and how it was derived based on the risk / uncertainty analysis and life cycle cost estimate funding profile.
- ☑ Results should be presented in formats that are useful for preparing reports and correspondence for higher authority.
- ☑ An electronic copy of the cost methodology/model and data should be provided with the cost estimate

GAO - High Quality Cost Estimation 12 Step Process (From Exposure Draft dated 7/4/07)

1. Define the Estimate's Purpose
2. Develop the Estimating Plan
3. Define the Program Characteristics
4. Determine the Estimating Approach
5. Identify Ground Rules and Assumptions
6. Obtain the Data
7. Develop the Point Estimate
8. Conduct Sensitivity
9. Conduct a Risk and Uncertainty Analysis
10. Document the Estimate
11. Present Estimate to Management for Approval
12. Update the Estimate to Reflect Actual Costs and Changes

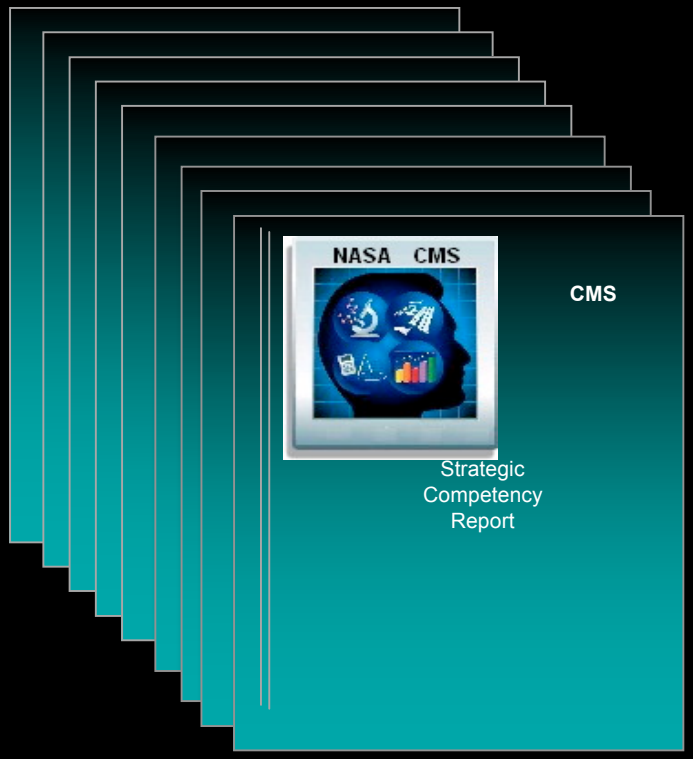
12 Step Process for High Quality Cost Estimation ~ becomes the "Standard"

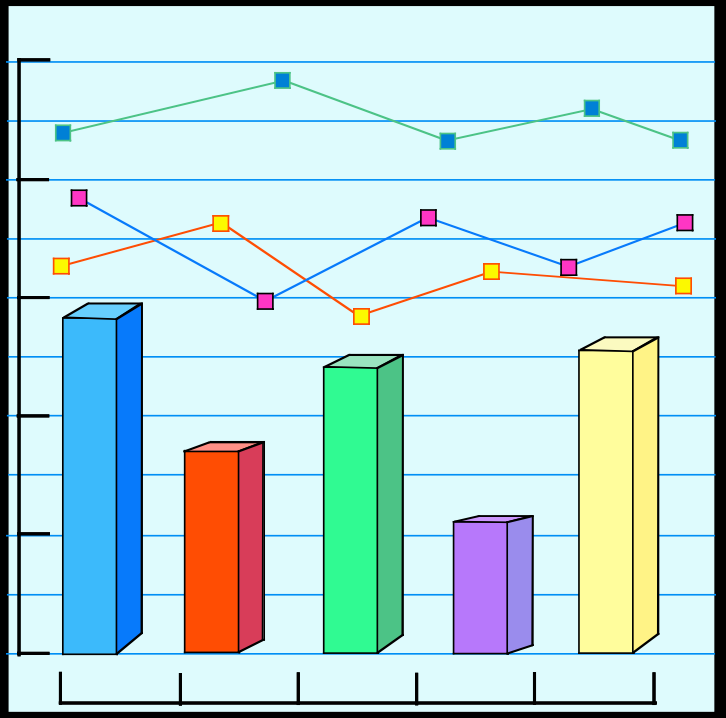
	12 Step Process	ARC	DFRC	GRC	GSFC	HQ	JPL	JSC	KSC	LaRC	MSFC	NSSC	SSC
1	Define the Estimate's Purpose		M										
2	Develop the Estimating Plan		MP										
3	Define the Program Characteristics (WF)		MP										
4	Determine the Estimating Approach		M										
5	Identify Ground Rules and Assumptions		M										
6	Obtain the Data		M										
7	Develop the Point Estimate		M										
8	Conduct Sensitivity		NM										
9	Conduct a Risk and Uncertainty Analysis		MP										
10	Document the Estimate		MP										
11	Present Estimate to Management for Approval		M										
12	Update the Estimate to Reflect Actual Costs and Changes		NM										

M = have Met all of the sub-task descriptions, MP = Making Progress, NM = Not Met all of the sub task descriptions

Cost Estimation & Analysis ~ Younger age workforce vs Gray Beards

- Who are the Cost Estimators and what is their Skill Level or Competency across the ten NASA Centers?

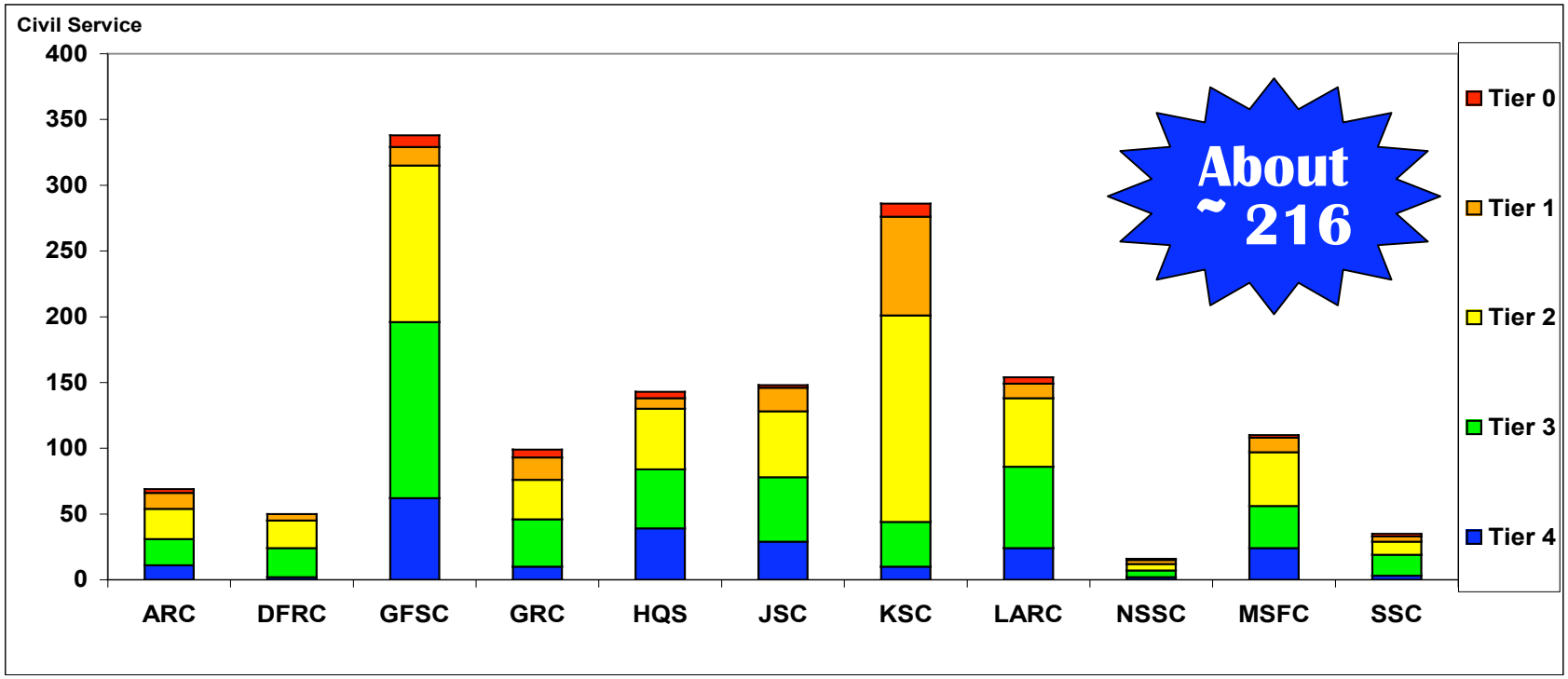




Cost Estimators by Competency by NASA Centers

NASA Competency Management System

CMS Code = 0121 "Cost Estimators" ~ By Tier Classification



	ARC	DFRC	GFSC	GRC	HQS	JSC	KSC	LARC	NSSC	MSFC	SSC	Total
Tier 4	11	2	62	10	39	29	10	24	2	24	3	216
Tier 3	20	22	134	36	45	49	34	62	5	32	16	455
Tier 2	23	21	119	30	46	50	157	52	5	41	10	554
Tier 1	12	5	14	17	8	18	75	11	3	11	4	178
Tier 0	3	0	9	6	5	2	10	5	1	2	2	45
Total	69	50	338	99	143	148	286	154	16	110	35	1448

Tier Levels (1 thru 4) Descriptions

1. **Basic Level** Tier Level #1 - An individual has a basic knowledge of the subject matter and shows an awareness of how this competency relates to their job.
2. **Working Knowledge** Tier Level #2 - An individual has a working knowledge of the subject matter such that they are able to effectively apply that in their job.
3. **Proficient** Tier Level #3 - Through the experience of applying their knowledge on the job, or other related activities, an individual has developed a thorough understanding of the subject matter AND is highly proficient in being able to apply that knowledge in their work environment.

Tier Levels (1 thru 4) Descriptions

4. **Subject Matter Expert (SME)** Tier Level #4 - Through years of experience, or advanced study, an individual has developed a comprehensive understanding of the subject matter and its interactions with other disciplines/competencies. The individual has advanced their set of skills to be able to apply their expertise to a multitude of projects and situations. The individual utilizes their in-depth knowledge to communicate and collaborate with peers within their normal work environment and outside to other professional business or technical communities.

Gray Beards vs Younger Age CE

- CMS Tier Level 3 & 4 is where the work is being performed. Gray Beards are often seen as the subject matter experts. Usually can be spotted at conference and symposiums like the one we are at today.
- Gray Beards can often perform a Cost Estimates is less time than a junior estimator and are probably "more productive" in-terms of producing a credible cost estimate. With the baby boomer syndrome rapidly approaching ~ Gray Beards needs to become "coaches".
- The symbol (right-hand corner) reflects ~ is the same symbol on NASA Cost Analysis Steering Group's (PBMA) Web Site.
- We MUST continue to communicate to one another, express one thoughts ~ into actions for the future of NASA Missions.

Building a Better NASA Workforce – National Research Council 2007 Report

Recommendation #1 - Collect detail data on NASA's workforce requirements at the Center Level. A bottom-up assessment of the current skills, experience levels and projected attrition for each individual NASA Center. Ensure that hiring constraints, such as pay-levels, ceilings and ability to recruit can be met.

Recommendation #2 - Hire and retain younger workers within NASA. Take full advantage of NASA Flexibility Act of 2004. Develop solutions that limit the flow of senior and highly skilled employees from industry to NASA.

Recommendation #3 - Ensure a coordinated strategy for aerospace workforce development among relevant institutions. Work together to develop an effective aerospace workforce ecosystem.

Building a Better NASA Workforce – National Research Council 2006 Report

Recommendation #1 - develop a workforce strategy for ensuring that it is able to target, attract, train, and retain the skilled personnel necessary to implement the space exploration vision and conduct its other missions in the next 5 to 15 years.

Recommendation #2 - adopt innovative methods of attracting and retaining its required personnel and should obtain the necessary flexibility in hiring and reduction-in-force procedures, as well as transfers and training, to enable it to acquire the people it needs. NASA should work closely with the DOD to initiate training programs similar to those that the DOD has initiated, or otherwise participate actively in the DOD programs.

Recommendation #3 - expand and enhance agency-wide training and mentorship programs, including opportunities for developing hands-on experience, for its most vital required skill sets, such as systems engineering.

NRC - Summary / Conclusion

- General Conclusions from the National Research Council

1. *NASA Could be in a position between 2012 and 2018 to have enough skilled personnel in areas key to implementation of the Vision for Space Exploration.*
2. Sustained excellence in space-related science, engineering, acquisitions, and other operational disciplines is vital to the future of U.S. space capabilities.
3. Departments and agencies that conduct space related activities shall establish standards and implement activities to develop and maintain highly skilled, experienced, and motivated space professional within their workforce.

Training & Certification Process

The following Summary / Conclusion are my thoughts . . .

1. Continue to foster the ***ONE NASA*** vision / philosophy across the Agency. By Co-Authoring this presentation with Stephen Chesley, Work-force Planning Specialist ~ has energized our spirits towards having a human presence on the lunar surface within the decade.

2. Simply "adopt" NRC recommendations in "*Building a Better NASA Workforce*". As Cost Estimators we all know that "a bottom-up cost estimate" is more desirable than a top down approach. We must work with the Center's Workforce Planning Teams to identify "who are the Cost Estimators? What are their skills, . . Who plans to Retire, . .? Etc.?

3. NASA PA&E CAD should consider to lead the Agency in "Bench-marking" Productivity Factors at each Center. Correlate "age" with CERs and produce a Forward Pricing Rate Document.

Summary / Conclusion ~ Continued

4. Help to establish a Forward Pricing Rate Proposal Process with a "Discloser Statement". What's in CM&O, and what's "in" or "is not" covered in SCAP. By working in conjunction with the Offices like: Office Chief Financial Officer (OCFO), and SCAP Director at HQ should help resolve "Full Cost Issues" when performing "in-house" cost estimates.

5. Adopt the GOA Cost Assessment Guide (CAG) as the "Best Practices" soon as it is released (expected 4th Quarter of 2007).
   a) Roll-out the CAG to all of the NASA Centers.
   b) The Executive Cost Analysis Steering Group (ECASG) should lead in performing a self-assessment stop-light metric scorecard, benchmark 2007 across each NASA Centers (no later than the 1st quarter of 2008).
   c) The PA&E CAD should make recommendations (living guide) back to GAO. Which in-turn will help to develop NASA Standards for the future of space exploration.

Summary / Conclusion Continued

6. NASA PA&E CAD should lead in the develop of a "Certification Process" for NASA's Cost Estimation Civil Service Community. This needs to be done in conjunction with Human Resources (HR). "Saturn" is an on-line training program. The current Tier System (Levels 1 thru 4) has a very subjective rating system and may be inconsistent at each NASA Center.
   - Career development recommended by the NRC (training and certification) for the Cost Estimator is essential **for the future of NASA Missions.**
7. NASA Cost Estimators should also pursue additional outside education sources; consider to join a professional cost society like; Society of Cost Estimating and Analysis (SCEA) or International Society of Parametric Analyst (ISPA). Both Societies have an established "Certification" process.

Questions ?

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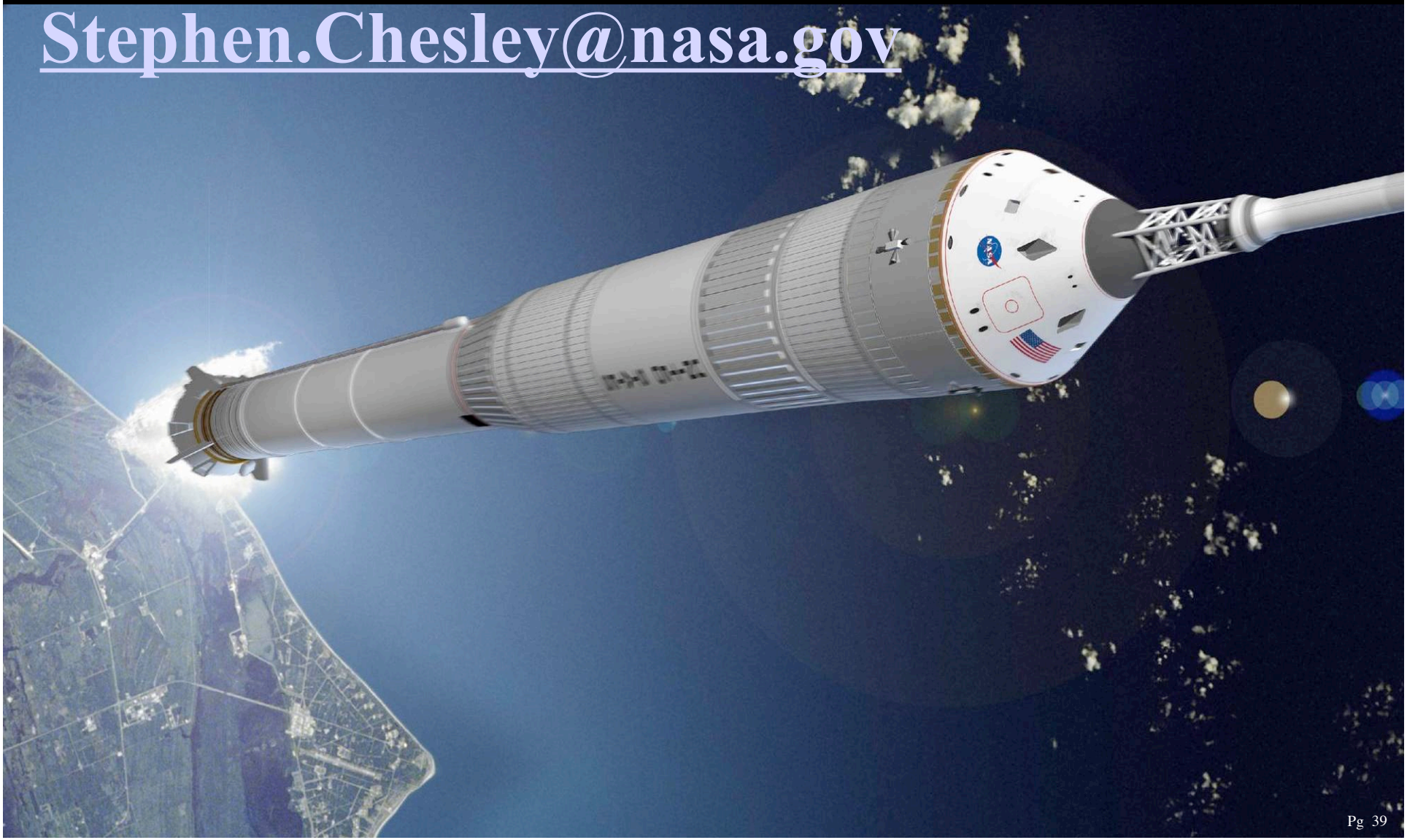

Back-up Material & References (Con't)

- **National Research Council**
  - Committee on Meeting the Workforce needs for the National Vision for Space Exploration
  - **2007 Report**
    - ISBN: 0-309-10838-1, 76 Pages http://www.nap.edu/catalog/11916.html
  - **2006 Report**
    - ISBN: 0-309-66114-5, 60 Pages http://www.nap.edu/catalog/11642.html

- **National Academy of Public Administration Study**
  - Building a Better NASA Workforce
    - 6 Findings with Recommendations, very similar to the NRC Study
    - http://www7.nationalacademies.org/ocga/testimony/Building_a_NASA_Workforce.asp

Back-up Material & References

- **GAO Report (Dated May 2004) GAO-04-642**
  - NASA Lack of Disciplined Cost Estimating Process Hinders Effective Program Management
    - http://www.gao.gov/new.items/d04642.pdf

- **NASA PA&E**
  - Meeting on Strategic Workforce Management Model (SWMM)
    - Further populate Demand and Supply Model (Get the Baseline Right)
      1. Improve the fidelity of the WIMS data within the budget horizon
      2. For existing projects, extend the WIMS data beyond the budget horizon

- **ASTM International Cost Estimate Standards**
  - **http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E2516.htm?L+mystore+dfdq1480+1183355467**

- Thank You ~ goes out to Greg Shell (DFRC) and to Karen Richey GAO