"Cost Escalation Alert for Requirements, Facilities,& GSE for Moon & Mars Program"

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Abstract

A background, timeline for Labor & Material up 10% to 110% Report. How much do you think KSC Construction Cost Escalations was for 2004 to 2006? And more importantly how much will it be for the Space Port Construction for 2007 thru 2015 for our $5 to $10 billion Moon Mars Facility Construction Program. This presentation will give some history as an aid to estimating the escalation for the Future Space Program Construction & GSE. It will also show a Cost Index Comparison to Engineering New Record (ENR) Construction Cost Index (CCI), and Building Cost Index (BCI) KSC Cost Index TR 1511 1974 to 2007, Nine other Cost Indexes, and Consumer Price Index, with Graphic Charts or History Comparison, and a JAB Computerized Cost Escalation Program for 1974 to 2020. Showing Current Projections and Worse Case Scenarios with potential impacts for more Hurricanes, Political, and Economical Impacts such as Oil, Gas, Environmental, Health & Property Insurance, and Building Codes. A Detailed Cost Engineering Cost Escalation Projection and Analysis for the ARES I, V, Orion Crew Capsule ($300 billion - Florida Today). With current examples of Cost Increases for Steel, Concrete, Copper, A Remember When Chart, and other reports of 8%, 10%, and 12% Escalation Projections.

Key Words

$5 to $10 billion, 10% to 110%, 2015, Building Cost Index, Concrete, Concrete Block, Construction Cost Index, Consumer Price Index, Copper, Cost Analysis, Economical, Future Space, Futuristic Cost Escalation, Graphic Charts, GSE, History, Hurricanes, Impacts, Impacts such as Oil, JAB Computerized Escalation, KSC Cost Index TR 1511, Labor & Material, New Record (ENR), Political, Quotes, Remember When, Space Port Construction, Stainless Steel, Structural Steel, Worse Case Scenarios.

Facilities & Ground Support Equipment, GSE

Some KSC facilities are LS-39 Launch Area including: VAB, LCC, OPF's, two launch pads, support buildings, crawler transporters, three launch platforms "MLP's", crawl-away, park sites, SSPF, O&C, RPSF, VPF, LETF, GSE (items used to transport, access, handle, protect, service, and check-out flight hardware/software on the ground such as; RSS, platforms, panels, ECS Systems, cranes, hoists, 15 devices, and auto couplers. See JAB Website www.lobiddervideo.com , Estimating Tools for pictures of GSE and facilities, also see JAB Vols. 14 and 15, pgs. 18-26, and 96-99. Also see website Searchable Vol. 18.

Background

The Author has been an important team leader in the war against construction cost escalation through education, lecturing, training, writing technical papers, improving labor productivity through measurement and surveys, and improving labor productivity by creating and developing over 300 education/estimating cost engineering tools/spin-offs for faster, better, and cheaper engineering (see 9/8/70 letter), chart on survey and votes 1970-2005 for reducing cost escalations. But most importantly, the draft chart date, 1/21/98, shows escalation reduced from 13.8% to a steady 1.6 to 3.76 rate - a great improvement, and one of the major reasons for the economic boom and prosperity, and labor productivity improvement since 1985. This is a major accomplishment of the teams of engineers, constructors, aerospace, and American people. Note the letter, charts, and surveys are part of Joe A. Brown's cost engineering seminar books; volumes 2, 3, and 7, which are copyrighted by Con$truction Co$t Con$ultant, Inc.

Also an important team member of KSC design engineering as KSC Lead Cost Engineer which was responsible for saving billions of dollars in the Apollo, Shuttle, and Space Station construction, as well as providing facilities <u>on or ahead of schedule, within budgets.</u> Note many of the over 50 technical papers documenting these facts.

April 1, 2004 - The author issued another <u>Cost Alert</u> due to KSC construction & GSE cost increases and projected increases. The major problems are increase in labor but most important in materials such as; steel, concrete, oil, copper, aluminum, roofing, piping etc. Also increases in insurance, medical, homeowner, etc. which cause increase in labor cost. Major reasons for these cost increases are the China booming economy, the declining dollar value, low interest rates causing a building boom especially in Florida and more recently 4 major hurricanes hitting coastal Florida. It is most important that corrective action to be taken ASAP. Therefore, this presentation is being updated for the 2004-5 cost alert and new surveys.

Chart #1 "Cost escalations and labor productivity survey, Nov. 21, 1970 - June 2005. 1357 votes, reference JAB Vol. 3, 6, 16, 20

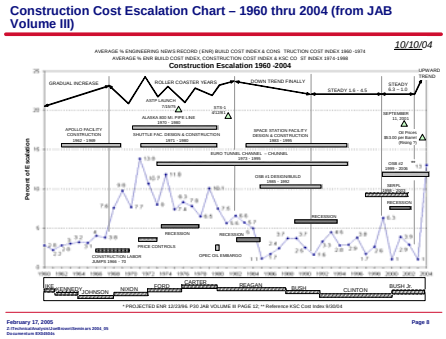
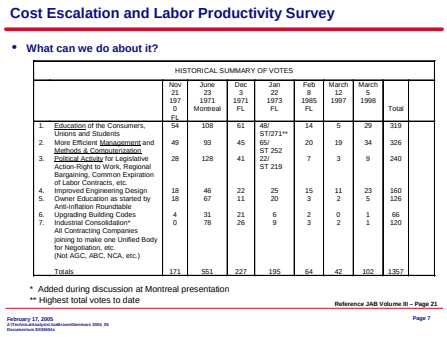


Chart #2 "Construction cost escalation chart", 1960 - 2005 - graphic relationship to escalation, economical, political, and some intervention projects. reference JAB Vol. 3, 6, 16, 20



Timeline

NEW 2004 CON$TRUCTION CO$T ALERT, LABOR & MATERIALS UP 10% TO 110% TIME-LINE

Dec. 15, 2003 - Concrete going up for '04 pg 65

Jan. 23, 2004 - "Wow" 8 craft labor rates go up

Feb. 2, 2004 USA CofF labor up 7% See J.A.B. for details *

March 31, '04 - KSC Cost Index Notes Big Jump In Material Prices and Labor

April 1, 2004 - <u>JAB Cost Alert</u> Steel, Copper, Concrete, Aluminum, Steel, Lumber & Labor, etc., please consider 4-10% per year for escalation, and do a cost analysis on major multi-year projects

April 5, 2004 - ENR Engineering News Record Notes Indexes and prices up 5 to 38%. NASDAQ starts to fall

April 14, 2004 - USA gets copy of March 25, 2004 letter* to all distribution steel scrap up 60% in one year and 110% in 2 years – Pipe and fittings priced at delivery only. No more holding price 30 days to 6 months. Hard to bid projects. One comment some Government contracts may have to include Escalation clause.

April 15, 2004 - JAB Cost Alert page 31. Consider 4-6% per year escalation and do cost analysis on major multiyear project. (Revised to 10%)

April 16, 2004 - JAB received cost engineering report on steel increase on Church project causes increase from $5.3 million to $5.5 million in 6 weeks*.

April 18, 2004 - JAB received Rebar Cost Study showing bid cost increases because scrap steel prices increase.*

April 19, 2004 - More trade labor increase electrical – 2nd time this year. Davis Bacon – April 2, 2004 - new labor rates with PT&I from $20.95/hr truck driver to $47.95/hr elevator construction. (Ironworkers $44.52, electricians $41.43, sprinkler fitter $44.40, pipe fitter $41.91

April 2004 - Sprinkler contractors reportedly using Schedule 10 – instead of Specified 40 – may have to be replaced in 2 other new buildings. However may be hurting to use schedule 40 on other new building as specified.

April 2004 - OSB #2 got bids for CAT.6 copper computer wiring/outfitting for high speed wideband intranet data.

April 20, 2004 Special permission to have a KSC 30-year special edition for NASA with time lines of Cost Increases.

April 21, 2004 - PBS Nightly Business Reports (NBR) shows food increase 10-50%.

April 2004 - JAB Cost Index Data Book shows commodity metal charts. Nickel, carbon steel scrap, SST scrap .20 to .75/lbs. Also along with copper up big. See page 180.

April 2004 - New workman's compensation rates go down but – we should still use 53% for Budget PT&I due to new special 99% premiums.

April 21, 2004 - USB Money Greenspan: Deflation is not a threat. S&P 500 Index takes big drop. Some commodities fall 10- 20%.

April 27, 2004 - Price quote Arnold Transportation, Inc. 1-800-876-4450 Jacksonville, Fl - $1,500 per 18 wheeler tractor trailer with driver from Columbus, Ohio to KSC, Fla. Plus load and unloading cost. Approximately $1.60/mile up from $.94/mile. Call for more current quotes update for Return To Flight (RTF) for special GSE availability, some special situations may cost up to $5,000/truck load.

May 3, 2004 - CNN Money "Buffet says inflation Heating up."

May 4, 2004 - Cement supplies drying up. No concrete for other new building, May 3 & 4. Concrete may go up to $500/cy in July & October, etc. Palm Beach Post. Com Rationing/Allocations may continue the rest of year.

May 6, 2004 - Cost Engineering Comments – Some reasons for big cost increases – US Dollar down 30%, scrap prices up big, some commodities up big – copper, steel, aluminum, oil, gas, asphalt, and cement. China booming 9.7% growth, last quarter, causing big demand. US growth rate up – best in 3 years, Iraq construction up, US housing market up big because of low interest rates, most types of insurance up – Medical, home, auto, etc., also transportation up as oil prices rise. But some things down – computers, PC, blinds, electronics, cell phones and long distance rates.

May 24, 2004 - ENR page 11 – Material "Cement Shortages Pressure Rates". The south east particularly affected. Demand up 24 million tons beyond the average US production. Supply problems could last a year. ENR page 20/21 Construction Cost up 6.4%, building costs up 8.1%. Materials up 16.5% change per year. Rebar steel prices continue to soar – up 40% above a year ago.

May 28, 2004 - Another Craft Labor Rate up – Painters

May 28, ,2004 - Florida Today "Cement Shortage Delays Construction" Pools will take longer and cost more.

June 2, 2004 - Central Florida Cost Report "Concrete and Steel Cost increase for now with talk of drywall. Some project waiting 30-40 days for concrete slabs, concrete may go up 20% more." Another comment delays will cost extra escalation and time which few are figuring now.

July 7-10, 2004 - For KSC construction project use 10% for escalation for 2004, 5% for 2005, and 2006 – but do a cost analysis and get quotes for major multi-year projects that are heavy weighted in concrete, steel, Rebar (Reinforcing Steel), copper, asphalt, and aluminum. Also

scheduling delays will cost extra for time escalation.

Some considerations in this percentage escalation –labor up 7%, KSC materials up 18.8%, 3/31/04, assuming 50% labor and 50% material would average 12.9%. Other thoughts, concrete to go up 20%, rebar 20-40%, say 30%, Steel 20-40%, say 30%. However, past history shows 1971 increase of 13.8%,

1975 – up 11.8% and 1980 up 10.1%. Table page 35 & page 4, and overall average 1974 – 2003 of 4.7%

Ref. JAB Vol. 15 page 353.

June 17, 2004 Boyken International Report "Steel Pricing out of Control" – Spring 2004 Report "Some economists predicted an impact but no one expected the increase of 40% to 60% experience in the last two months" – However steel, scrap metal, rebar and structural steel prices should stabilize as shown in graph A, B & C – Forecast.

June 18, 2004 KSC Davis Bacon General Labor Rate goes up to $19.52 with fringe.

June 28, 2004 - ENR "Inflation It's Back" CCI up 6.2%, BCI up 8.7%, Material up 19.6%, p 22-28, 17 other indexes up also (Engineering News-Record weekly magazine cover). June 30, 2004 - KSC Cost Index Material up 28%. Labor up 1.15% Index up 13.4%.

July 1, 2004 - JAB presents "KSC Construction Cost Alert" L & M up 10-110%.

July 5, 2004 - ENR p18 Building-Productivity & Enhancements Study

July 19, 2004 - ENR CCI up 6.4% BCI up 9.0% materials up 20.9%

***See JAB about these special confidential reports**

Aug/Sep 2004 - ENR's <u>inflation rates triple last year</u> (page 24)

Sept. 30, 2004 - KSC Cost Index 11.69% and 23.53% per year (page 2)

Oct. 4, 2004 - ENR Magazine Construction Index up 8% change per year, Building Index up 10.3% change per year, Material Index up 22.4% change per year, See new ENR's charts – Cement, concrete, asphalt, block

Chart #3 - Construction economics. "Inflation is Back" ENR 6/28/2004

Chart #4 - Annual escalation average increase with projections, CD ROM #19

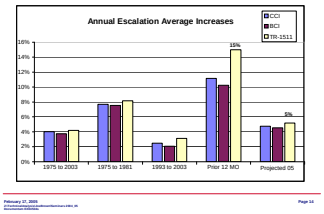
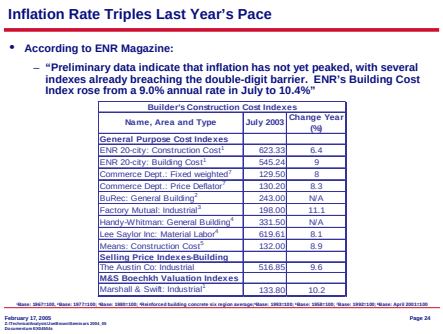


Chart #5 - Inflation rate triple, last year's page. ENR, July 2006



Oct. 10, 2004Cost Engineer recommends 13% escalation for 2004, (15% - 2% for productivity increase and design enhancements) and 5% for years 2005 and 2006. <u>But do a cost analysis and get quotes for major multi-year projects</u> that are heavy weighted in concrete, steel, rebar, copper, asphalt, and/or aluminum etc. Schedule delays and hurricane impacts will cost extra for time escalation.

Oct. 19, 2004 - "Cost Alert Presentation" to Florida Section AACE Int. by NASA Glenn

Butts and Joe A. Brown with major comments on oil @ $55.00/BBL; Argentina Escalation Rate of 30% compared to KSC rate of 13% estimated; China continuing impact preparing for 2008 Olympics, 20 Newly planned Nuclear power plants of 1000 M.G. Watts - Billion dollars harbor & Hydro Dam."

Various studies were presented with supporting information from various materials cost indices that escalation at the KSC was accelerating at a greater rate than previously anticipated.

At the end of the presentation that same earlier group survey was taken and it was found that in all cases people's earlier predictions of escalation percentages had now increase.

Oct. 27-28, 2004 - Joe's Cost Alert-Up-Date China raises interest rate (1st time in 9 years) commodities, oil, prices drop. Constructions cost escalation fears drop some.

Nov. 2, 2004 - Glenn Butts "Enr Cost Index Declines" = CCL & BCI Index numbers - chart enclosed.

Nov. 4, 2004 - President re-election confirmed, stock market goes-up. Space program continues back to the moon and mars.

Nov. 17, 2004 - "Wholesale prices soar" PPI leaped 1.7% last month driven by surging energy costs. Is inflation back? Biggest jump in nearly 15 years. CNN Money (59% worry about higher inflation) of 16,161. See Vol. XIV p. 243, Nov. 15, 2004

Dec. 31, 2004 - KSC Cost Index up 24.36% for 2004 labor up 3.12%, material up 53.98% - Finally Sept & Dec. Growth rate flatten out per KSC Index.

Feb. 14, 2005 - ENR CCI up 6.4% BCI up 8.3% and materials up 16.9%

July 18, 2005 - JAB comment on Escalation use 5.2% for escalation.

Aug. 28, 2005 - Katrina floods New Orleans after hitting Key West, Fla

Sept. 22, 2005 - JAB Cost Alert #2 consider 10% escalation for 2005 - 2008 due to Katrina and Rita hurricane impact on oil, natural gas, and building materials and construction labor impact, etc. Get quotes and make analysis for major year project.

Sept. 30, 2005 - Glenn Butts KSC Cost Index, pg. 16 & 17

The Florida construction boom is showing signs of easing and the preponderance of the 2004 hurricane damage repairs have occurred. This would normally be a precursor to a leveling off and possible reduction in the cost index However the recent hurricane could quell the expected relief, generally hurricanes only affect the local area were the damage actually occurred.

However Hurricane Katrina was a monumental event which inflicted substantial damage in four states, and minor damage in several more, early estimates are for $100 to 200 BILLION dollars in damage.

Expect higher prices for steel, roofing products, concrete, insulation, drywall & copper as a result of heavy consumption during the rebuilding process, stockpiling of materials, and damage to manufacturing facilities. For example Air Products & Chemicals facilities sustained substantial damage. They are the primary supplier of liquid hydrogen, a critical component in the steel production processes, to the steel industry.

Labor prices could also rise since workers will be enticed to the storm ravaged area by the lure of higher wages, and all the overtime they can work. Ergo KSC could be affected by labor and material shortages, which will transform into increased costs. The repercussions will not be a brief spike, but a plateau that will ramp up rapidly and should begin tapering off sometime in 2007.

The Exploration Program is gearing up; studies and designs for a massive construction program are beginning. Early indications are for two major construction phases, the first will be for the Crew Exploration Vehicle (CEV) & Cargo Launch Vehicle (CLV) which are tentatively slated for inaugural launch in 2011, the second is for the Shuttle Derived Inline Heavy (SDIL)

If the CEV program is to meet the initial schedule $500 Million to $1 Billion in construction contracts will be awarded, and completed between 2007 & 2010

After the last shuttle flight currently slated for 2010 the second phase will be work for the SDIL will continue until 2015. The exploration construction expenditures are expected to augment the existing "normal" construction efforts, not replace them, which when added to the exploration construction program equates to $2 Billion dollars in KSC construction of facilities (CoF) work between 2006 and 2020. Substantial additional expenditures will be required for research and development (R&D) functions that will be required to activate the facilities, and the fabrication of ground support equipment (GSE) which should add an additional $1 to $2 Billion into the local economy. Now that you have been burdened

with a fragment of the details, there are many more factors that will affect this dynamic situation, like the cooling housing market, rising interest rates, oil prices, future hurricanes, terrorist activities, other large construction projects in the area, potential of more restrictive building codes, etc. you should be wondering how your KSC projects will be impacted. There is a simple answer to this complex economic question, but near term, generally expect to see an initial cost spike, primarily as a result of material prices

Keep in mind costs could be substantially higher on some projects, like roof replacements

Far term, when exploration projects are initiated, more substantial increases are anticipated

This will be primarily be a result of saturation of the local contracting firms, yes of course this will attract some large firms to KSC, but they typically hire many local contractors, they also tend to absorb the local trade workers. This will result in a requirement to recruit "critical trades" from outside of the immediate area. When contracting firms are overwhelmed with work costs increase primarily, for two reasons lack of competition, and cost to recruit & entice them to travel to the area. Once there housing must be obtained, often in competition with tourist's who can afford substantially higher rates. Significant overtime may be required to maintain already tight schedule, which will also affect project costs

Oct. 2, 2006 - E mail alert update a recent REED (RS Means) report shows facility construction costs up an average of 10% and some materials cost up 12% to 24% (Remember our cost alert of 4/1/04 and update months before other report of pending cost escalation of 6/10% per year. This REED report confirms our early projection.

Nov. 1, 2006 - Good News - Florida Today - State Approves Lower Workman's Compensation Rate (lower by nearly 16% (15.7%) to save employers 400 million)

Nov. 11, 2006 - A mild hurricane season for 2006 should offer some relief to our current escalation problem.

Dec. 1, 2006 - Christmas report, possible answers to cost escalation and U.S. economy problems. When high construction cost escalation should start stabilizing.

Dec. 2, 2006 - How long will high construction cost escalation last?

1. Until US dollar goes up 30% (to par)

2. Until US recession/major depression in housing market

3. Until successful use of Helium 3 as a US electrical power source. This may take several years.

Chart #6 Cost index comparison. ENR, CCI, BCI, KSC cost index & CPU shows escalation 1974 with projection to 2016 wit noted economical, political, weather milestones

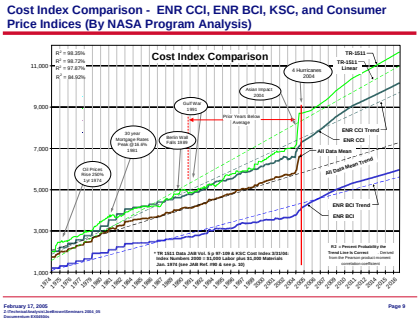


Chart #7 - KSC annual escalation 1974-2020 using JAB computerized excel cost escalation program. $2000 - $17,000 -- worst case scenario to $22,500

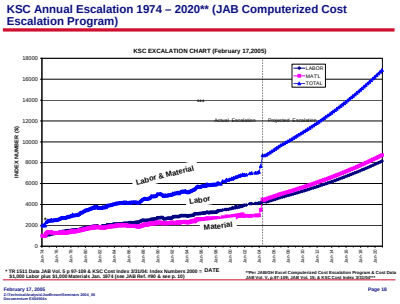


Chart #8 - Report by John Janacek of CW driver escalation 12%

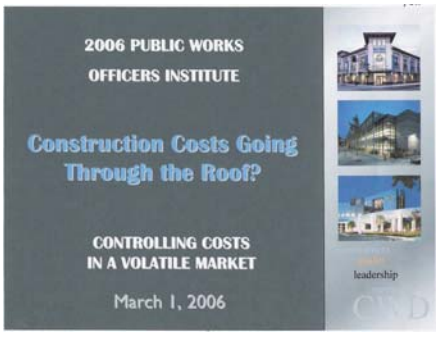
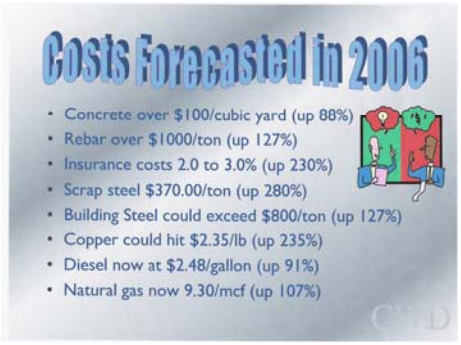


Chart #9 - Cost forecasted in 2006



What is presently being done to keep escalation down?

- **Increased productivity, examples: computerization, electronic energy, - efficiency**
- **CPI consistency under estimates, cost increases to keep social security, labor, pension down - medical, property taxes, insurance, homeowners, etc.**

COST ALERT

Now the surprising, confidential, sensitive background - How did the author project the cost escalation alert months before the usual daily and weekly reports? The surprise was a valuable use of the London Financial Times Daily with independent, global commodities, currency and construction reports of increasing demand and lack of increasing supplies, especially China and Indian growth. The sharing of Cost Data between USA, NASA, KSC Support Contractors, vendors and suppliers and bidding problems due to hurricanes, disasters, etc. The KSC Cost Index TR1511, 1974-2007 was especially valuable with labor rates and materials (240 items}, productivity and workman's compensation rates. The Florida Section and AACE International "Cost Escalation and Labor Productivity - What We Can Do About It" and what we did about it - meeting programs, surveys, seminars, and symposiums since 1970 and AACE local and national members reports and alerts, etc. Also, the over 300 education and estimating tools created, developed, tested,

and documented by KSC, USA, CCCI, and JAB teamwork since 1963-2007. Therefore a special thank you to all, especially, Susan, Dallas, Mel Jones, Gene, Glenn, Steve, Mike, and Phil and our team work members. See lobidder video and bid strategy DVD "How Successful Contractors Solved High Cost Escalation Problem - Runway and Processing Fac.

What are the newest and/or most exciting and important of the 300 Cost Engineering Tools?

1. **Over 300 KSC Cost Indexes provide experience and back up, early cost alert for construction and GSE Cost Escalation, latest dated December 30, 2006 (one of the most important tools)**
2. **JAB Seminar #9, Vol. 21, "Government Contractor and Computer Estimating for A&E"**
3. **Near 500 systems summaries, facilities, GSE, processing, pads, over fifty different type of projects**
4. **21 Computer Templates, Budgets, Design, Preliminary and Detailed Estimates, etc.**
5. **Computer Aided Design/Automatic Computer Cost Estimating (CAD/ACCE)**
6. **Estimating Fiber Optics Cable Method, fast and easy**
7. **Remote Automated Panels, Man-hours, Method, fast and easy, $10,000-$300,000**
8. **Cost per component, fast and easy, $1,000-$2,500**
9. **Fine tuning, number of bidders concept, bid strategy**
10. **Construction Management Analysis Method**
11. **Cost Index Analysis Matrix for design, productivity, etc.**
12. **Cost Escalation Alert Analysis, four new technical papers**
13. **Launch Pad Cost Comparisons, $20 million to $300 million dollars**
14. **Detailed Launch Pad Cost Breakdown, $1.2 billion dollars**
15. **VAB Cost Studies, $160 million to $2 billion dollars**

16. **"Accurate Estimates in a Minute", by NASA/KSC Glenn Butts (one of the newest, most important tools)**
17. **Searchable CD-ROM by Dallas Lee/SGS**
18. **Abstract of Bids, Cost Summaries, System Summaries, hyperlinked**
19. **JAB Vol. 18 Searchable 254 Tools and Prices, sources, 25 book indexes, 20 CD-ROM's, see www.lobiddervideo.com**
20. **Searchable CD-ROM's of System Summaries with Excel Search**
21. **Near 30 Special, Unique Cost Studies, Change Orders, COC, Mark-Ups, O, H& P, etc.**
22. **JAB PowerPoint, "How to Make System Summaries"**
23. **JAB PowerPoint, "Aerospace Cost Factors", 8 different seminars lasting from 3-40 hours, 49 successful seminars**
24. **9 Different Seminars lasting from 3 to 40 hours**
25. **DVD on ";Bidding Strategy" on Aerospace and Construction**
26. **New CD-ROM's, #18, 19, 20, 21, and #25**
27. **"Space Power for an Expanded Vision" by W.M. Braselton, 15 minute video, DVD soon**
28. **New Multi page system summary/cost model of the $150 million dollar VAB**
29. **NASA/KSC CD-ROM Apollo, Space Shuttle, ISS, Cost Data, History by Glenn Butts, 2006**
30. **475 Projects, Cost Estimates, over 45,000 pages (microfilm)**
31. **JAB Seminar #9, Bidding Process and Cost Engineering, Vol. 20**
32. **JAB Seminar #10, A&E Project Management Estimating Seminar**

Facilities & Ground Support Equipment, GSE

Some KSC facilities are LS-39 Launch Area including: VAB, LCC, OPF's, two launch pads, support buildings, crawler transporters, three launch platforms "MLP's", crawl-away, park sites, SSPF, O&C, RPSF, VPF, LETF, GSC (items used to transport, access, handle, protect, service, and check-out flight hardware/software on the ground such as; RSS, platforms, panels, ECS Systems, cranes, hoists, lifting devices, and Auto couplers. See JAB Website www.lobiddervideo.com , Estimating Tools for pictures of GSE and facilities, also see JAB Vols. 14 and 15, pgs. 18-26, and 96-99. Also see website Searchable Vol. 18.

SUMMARY

What should be used for cost escalation for the NASA KSC Space Program to the Moon & Mars. Consider using 6% to 10% per year, but on major multi-year that are heavy weighted in concrete, steel, rebar, copper, asphalt & aluminum do a cost analysis, get quotes on major cost items. Remember that impact, scheduling delays with cost extra for time extensions & C.O.'s

A special thank you to AACE, KSC, USA, and team members for your support.

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1962 to Present. Con$truction Co$t Con$ultant, CCE President. Consultant services, writing, training, educational seminars, cost engineering, cost estimating, preparing, reviewing, cost analysis of over $10 billion of cost estimates for facilities, construction, GSE, activation, etc. With over 250 Aerospace cost engineering tools, books, CD ROM's, DVD's, videos, cost studies and new exciting, conceptual estimating methods. Over 2000 seminars students from six continents. Space Works Engineering Inc. (SEI) FGOA/D4OPS contract, July 19, 2003 thru Jan. 15, 2004 with near $4 billion of conceptual cost estimates and analysis.

Joseph A. Brown created a world class total Aerospace Co$t Estimating, Co$t Engineering, CM for Facilities, Construction, GSE system and activation. This system and process has proven performance and results, saving billions of dollars with near 300 unique tools, including over 30 new, exciting tools, technical papers, and cost studies for space exploration to the Moon, Mars, and the Universe. This world class cost engineering system was created from five tools in 1963 by JAB and his KSC teamwork effort.

July 1, 1996 – October 28, 2005. Lockheed Martin/USA Space Flight Operations Contract (SFOC) as Senior Engineer, Certified Cost Engineering, Cost Consultant for facilities and ground support equipment (GSE) and construction, preparing, reviewing, cost analysis, (over $10 billion of cost estimates), modification management, training, seminars and computerization. These important estimating tools:

- **Helped reduce change order (C.O) cost from 52% to 12.50% of bid cost with 150 ways to reduce C.O. cost on over #300,000,000 of Construction and GSE**
- **Helped improve design performance, cost and schedule performance with large bonuses to KSC team work members through cost engineering, construction management, cost control, planning and scheduling, cost analysis, computerization, and incentive contract, etc.**
- **Aided NASA/KSC Designing Engineering in restart of cost engineering presence, providing consulting services, resources, etc.**

April 1, 1996 - August 15, 1996. (Con$truction Co$t Con$ultant, Inc. CCE Cost Consultant to Lockheed Martin in Denver, CO, Titusville, and Merritt Island, Fl for EELV Launch Facilities at VAFB and CCAGS, Conceptual Cost Estimating, Cost Engineering Review, Analysis and Independent Cost Estimate for $300 million launch pads concurrently work with Lockheed USA.

1963 – 1995. (GS11/14) National Aeronautics and Space Administration (NASA) Kennedy Space Center (KSC), Lead Cost Engineer, Senior Advisor and Coordinator for development of cost engineering and estimating for KSC facilities, equipment, and construction. Prepared and reviewed over $17 billion of cost estimates, including pre-conceptual space shuttle launch facilities at six locations, Oct. 1970 for $7.44 billion, ELV $5.9 billion and LC39 VAB and Launch Pad over $200 million, 1963-1970. See the website for detail resume (www.lobidderviedo.com) or contact me at lobiddervideo@cfl.rr.com