SELECTED ACQUISITION REPORT (SAR) COURSE

Quantity Variance

DEFINITION AND EXPLANATION

Quantity Variance is defined as the change to program's cost estimate that results from an increase or decrease in the number of reportable end items for which unit cost reporting is required and/or for which cost-quantity curves have been prepared. For example, if the buy quantity for engines increased but the number of airframes (the reportable end item) remains constant, then your program did not have a quantity change. The change attributable to the increase in engines would normally be classified as an Estimating Variance.

The Quantity Variance category is limited to recurring flyaway costs funded from the R&DT&E and procurement appropriations; it is not applicable to MILCON and O&M. For example, a change in the number of bases or operational sites funded from the military construction appropriation is normally classified as an estimating change.

All quantity changes will be based on the current SAR baseline (PE, DE, or PdE) cost-quantity curves. The difference between the cost of the quantity change based on the SAR baseline cost-quantity curve and the cost based on the PCE cost-quantity curve will be assigned to the flyaway categories of Schedule, Engineering, Estimating or Other, as appropriate. This process of assigning or allocating will be discussed in its own section of this document (see "Quantity Allocation").

MATHEMATICAL PROCEDURE

Quantity Variance must be calculated if the total number of reportable end items (i.e., airframes, hulls, etc.) has changed in this reporting period.

The calculation of quantity variance is a difficult and cumbersome process because we must isolate this change from an accompanying change in schedule. The following computational process was designed to hold all other factors constant while the effect of changing the quantity is calculated.

To calculate Quantity Variance, two separate values for the change in quantity must be computed. The first value is Total Quantity Variance. This value is the total change resulting from the change in the number of reportable end items for this SAR period. Total Quantity variance is calculated in base-year dollars at the recurring flyaway level. The calculations are made using a cost-quantity curve that is based on the previous SAR's current estimate of quantities and recurring flyaway costs (i.e., the PCE).

The second value to be computed is True or actual Quantity Variance. This is the value that will reported as Quantity variance in subsection 13.a of the SAR. True Quantity variance is also calculated in base-year dollars at the recurring flyaway level. These calculations are made using a cost-quantity curve that is based on the current SAR baseline (PE, DE, or PdE) quantities and recurring flyaway costs.

Total Quantity variance is the value of the additional or deleted units based on the cost-quantity relationship that existed at the last SAR submission date, that is, the cost of these units based on the price estimate at the time of the last SAR submission to Congress.

True Quantity variance is the value of the additional or deleted units based on the cost-quantity relationship that existed at the time your current SAR baseline was established. That was the cost of these units at the time of at the initial submission when you submitted the first SAR containing the current SAR baseline of the SAR reflecting the current SAR baseline.

Quantity Variance

The final step in the computation of Quantity Variance is to reconcile the difference between the two quantity variances we have calculated. This process of reconciliation is called a Quantity Allocation. The difference between Total and True Quantity values (the amount to allocate) is caused by the changes to recurring flyaway unit cost and its resulting cost-quantity curve since the SAR baseline was first established. These changes were reported as cost variances in the previous SARs. The only variances that can cause recurring flyaway costs to change (i.e., to cause a shift in the cost-quantity curve) are Schedule, Engineering, Estimating, or Other. During the allocation process the difference or amount to allocate is broken up and assigned to the variance categories that historically caused the shift in the cost-quantity curve. The mathematics of quantity allocation are covered in the "Quantity Allocation" section of this manual.

There are two separate computational paths used to calculate quantity variance: the first, to be followed if you are calculating the effect of a quantity increase; and a second, if you are calculating the effect of a quantity decrease.

Note: Different computational paths for quantity increases and decreases are a result of a recent change in guidance from OSD. This change in methodology was necessitated by the severe cut backs in procurement quantities experienced by many weapons programs. The old method of computing Quantity Variance provided an acceptable answer in cases where the program had experienced a quantity increase or a mild quantity decrease; however, this method tended to understate the effect of quantity change and overstate the effect of an accompanying schedule change in programs experiencing large scale cut backs in quantity.

Quantity Variance

Before we begin to outline the computational steps that must be taken to calculate quantity variance in either case, we need to define some of the terms that will be used.

TERM	DEFINITION
New Quantity	Current SAR's total number of the end items. This is the total of the quantity column of subsection 16b. of the current SAR.
New Schedule	Current SAR's arrangement of units, by year. These are the same numbers as the yearly entries of the quantity column of subsection 16b. of the current SAR.
Old Quantity	Previous SAR's total number of units. This is the total of the quantity column of subsection 16b. of the previous SAR.
Old Schedule	Previous SAR's arrangement of units, by year. These are the same numbers as the yearly entries of the quantity column of subsection 16b. of the previous SAR.
New Schedule, New Quantity	Current SAR's quantity and schedule. This is the same total and its arrangement as presented in the quantity column of subsection 16b. of the current SAR.
Old Schedule, Old Quantity	Previous SAR's quantity and schedule. This is the same total and its arrangement as presented in the quantity column of section 16b. of the previous SAR.
New Schedule, Old Quantity	Previous SAR's quantity arranged on the new schedule. This arrangement of the old quantity is used to calculate quantity and schedule variance in case of a quantity increase. This quantity stream is calculated by placing the new schedule's yearly quantity in the same year's block until the old quantity total is used up. The final year's entry will be a balancing figure. See the example below.
Old Schedule, New Quantity	Current SAR's quantity arranged on the old schedule. This arrangement of the new quantity is used to calculate quantity and schedule variance in case of a quantity decrease. This quantity stream is calculated by placing the old schedule's yearly quantity in the same year’s block until the new quantity total is used up. The final year's entry will be a balancing figure. See the example below.

SELECTED ACQUISITION REPORT (SAR) COURSE

Example of calculation of New Schedule, Old Quantity:

	1997	1998	1999	2000	2001	2002	TOTAL
New Schedule New Quantity	10	20	40	40	40	20	170
Old Schedule Old Quantity	10	20	30	30	35	35	160
New Schedule Old Quantity	10	20	40	40	40	10	160

Note: The last year entry for New Schedule, Old Quantity is a balancing figure.

Example of calculation of Old Schedule, New Quantity:

	1997	1998	1999	2000	2001	2002	TOTAL
New Schedule New Quantity	10	25	25	30	30	35	155
Old Schedule Old Quantity	10	20	40	40	40	40	190
Old Schedule New Quantity	10	20	40	40	40	5	155

Note: The last year entry for Old Schedule, New Quantity is a balancing figure.

The following table lists the data needed to compute Quantity Variance and the sources of that data:

DATA NEEDED	SOURCE
1. SAR baseline cost-quantity curve data	1. SAR section 19/1st SAR reflected current SAR baseline.
2. Current estimate of reportable end items quantities and schedule	2. Congressional Data Sheets
3. Previous current estimate of reportable end items quantities and schedule	3. Previous SAR's section 16b.
4. Previous current estimate of recurring flyaway costs in base-year dollars	4. Previous SAR's section 16b.
5. Current SAR Indices	5. PEO

Quantity Variance

Variance Calculations for a Quantity Decrease:

TOTAL QUANTITY VARIANCE:

Step 1: Compute a cost quantity curve (PCE) from the previous SAR's quantity and BY$ recurring flyaway data. The resulting First Unit Cost and Slope will be used throughout the Total Quantity Variance calculations.

Step 2: Compute the quantity stream Old Schedule, New Quantity as detailed in the previous section.

Step 3: Apply this calculated (Step 2) quantity stream Old Schedule, New Quantity to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 4: Apply the quantity stream Old Schedule, Old Quantity to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 5: Subtract the cost estimate Old Schedule, Old Quantity (Step 4), from the cost estimate Old Schedule, New Quantity (Step 2). The resulting cost stream is Total Quantity Variance in BY$.

Note that by comparing Old Schedule, New Quantity to Old Schedule, Old Quantity we have held the effect of schedule constant (Old vs Old) and thus have isolated the effect of the quantity change (New vs Old).

Step 6: Calculate Total Quantity Variance TY$ by multiplying the BY$ Total Quantity Variance figures (Step 5) by the current set of price indices.

TRUE QUANTITY VARIANCE:

Step 1: Compute a SAR baseline cost-quantity curve (PE, DE, PdE) from the current SAR baseline quantity and BY$ recurring flyaway data. This data is found in subsection 19.f of the SAR. The resulting first unit cost and slope will be used throughout the True Quantity Variance calculations.

Step 2: Compute the quantity stream Old Schedule, New Quantity.

Step 3: Apply the calculated quantity stream Old Schedule, New Quantity (Step 2) to the PCE Cost-Quantity Curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 4: Apply the quantity stream Old Schedule, Old Quantity to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 5: Subtract the cost estimate Old Schedule, Old Quantity (Step 4) from the cost estimate Old Schedule, New Quantity (Step 2). The resulting cost stream is True Quantity Variance in BY$.

Note that by comparing Old Schedule, New Quantity to Old Schedule, Old Quantity we have held the effect of schedule constant (Old vs Old) and thus have isolated the effect of the quantity change (New vs Old).

Step 6: Calculate True Quantity Variance TY$ by multiplying the BY$ True Quantity Variance figures (Step 5) by the current set of price indices.

Quantity Variance

Example Of Quantity Variance Calculation:
For this example we will assume the following scenario:
The quantity of production aircraft has been decreased from 170 to 160. In addition, the peak annual procurement has been increased from 35 to 40.

19. Cost - Quantity Information:

a. Baseline - - Development Estimate, FY 1989 BY$
b. End Item - - AX1-TS
c. Cost-Quantity Relationship -- Log-Linear Unit
d. First unit cost - - $15.47627 million
e. Slope - - 86.962%, B = -0.2015
f. Tabular Data – Since the R&D units are lab/engineering models and not actual prototypes, they are not included in the cost-quantity calculation.

Example Data:

Fiscal Year	Quantity	Flyaway Cost (Base-year $ in millions)		Plot Point (X - Axis)
		Non recurring	Recurring	
1988	8	15.7	103.2	3.5
1989	24	11.3	195.8	18.9
1990	36	7.4	235.4	49.2
1991	48	0.5	283.2	91.2
1992	48	0.5	271.0	139.7
1993	48	0.0	262.2	187.9
1994	48	0.0	256.5	236.0
1995	40	0.0	212.6	280.2
Total	300	35.4	1819.9	N/A

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
PCE END ITEM QTY/SCHED	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
PCE BY$ RECUR. FLYAWAY	0.0	186.1	314.5	0.0	0.0	185.6	141.0	127.5	239.0	282.3	278.6	273.1	268.6	245.7	183.9	0.0	2725.9
CE END ITEM QTY./SCHED.	0	12	24	0	0	12	12	12	12	12	12	12	24	24	24	26	160
NEW INDICES	1.1521	1.2022	1.2506	1.2945	1.3337	1.3684	1.4056	1.4454	1.4879	1.5323	1.5783	1.6257	1.6744	1.7247	1.7764	1.8297	

SELECTED ACQUISITION REPORT (SAR) COURSE

Quantity Variance

Step 1: Prepare a matrix to compute Old Schedule, New Quantity.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. New Sched New Quantity	0	12	24	0	0	12	12	12	12	12	12	12	24	24	24	26	218
2. Old Sched Old Quantity	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
3. Old Sched New Quantity	0	12	24	0	0	12	12	12	24	30	30	30	30	2	0	0	218

New Schedule, New Quantity is taken from the quantity column of section 16b. of the current SAR. Old Schedule, Old Quantity is taken from the quantity column of subsection 16b. of the previous SAR.

Old Schedule, New Quantity is prepared by arranging the new quantity over the old schedule. This is done by starting in the earliest program year and copying the old schedule values into the corresponding new schedule, old quantity years until the total of this quantity stream equals the new quantity.

Compute Total Quantity Variance:

Step 2: Compute a cost-quantity curve from the previous SAR's recurring flyaway data. The resulting first unit cost (T1) and slope will be used to calculate Total Quantity Variance.

Data Input:

PCE END ITEM QTY/SCHED	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
PCE BY$ RECUR. FLYAWAY	0.0	186.1	314.5	0.0	0.0	185.6	141.0	127.5	239.0	282.3	278.6	273.1	268.6	245.7	183.9	0.0	2725.9

Result: First unit cost - - $23.0255 million Slope - - 88.3133%

Step 3: Using the PCE cost-quantity data computed in Step 2, calculate a BY$ estimate of recurring flyaway costs by applying The Old Schedule, New Quantity (calculated in Step 1).

Note, the mathematical steps to manually calculate a cost estimate from a cost-quantity curve are long and cumbersome. Since most program offices have computer models with which the preparer can calculate cost streams from a cost-quantity curve and because the CARS Computational Model automatically performs these calculations, the actual mathematics involved with applying these quantities to the curve are not detailed in this manual.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. Old Sched New Quantity	0	12	24	0	0	12	12	12	24	30	30	30	30	2	0	0	218
Applying these Qtys to the PCE curve yields the following:																	
2. BY$ recurring flyaway based on the Old schedule & New Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	249.6	296.9	284.4	274.7	266.8	17.5	0.0	0.0	2317.7

SELECTED ACQUISITION REPORT (SAR) COURSE

Quantity Variance

Step 4: Using the PCE cost-quantity data computed in Step 2, calculate a BY$ estimate of recurring flyaway costs by applying the old quantity and the old schedule data.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. Old Sched. Old Quantity	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
Applying these Qtys to the PCE curve yields the following:																	
2. BY$ recurring flyaway based on Old schedule & Old Quantity	0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	249.6	296.9	284.4	274.7	266.8	260.3	187.2	0.0	2747.7

Step 5: Compute BY$ Total Quantity Variance by subtracting the recurring flyaway estimate you calculated in Step 4 from the estimate calculated in Step 3.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. BY$ recurring flyaway based on Old schedule & New Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	249.6	296.9	284.4	274.7	266.8	17.5	0.0	0.0	2317.7
2. less	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	
3. BY$ recurring flyaway based on Old schedule & Old Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	249.6	296.9	284.4	274.7	266.8	260.3	187.2	0.0	2747.7
4. = BY$ Total Quantity Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	-242.8	-187.2	0	-430.0

Step 6: Compute TY$ Total Quantity Variance by multiplying BY$ Total Quantity Variance (Step 5) by the current set of indices.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. BY$ Total Quantity Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	-242.8	-187.2	0	-430.0
2. Multiplied by	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	
3. Current SAR's Indices	1.1521	1.2022	1.2506	1.2945	1.3337	1.3684	1.4056	1.4454	1.4879	1.5323	1.5783	1.6257	1.6744	1.7247	1.7764	1.8297	
4. = TY$ Total Quantity Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	-418.75	-332.54	0	-751.3

Calculate True Quantity Variance:

Step 7: Using the baseline cost-quantity data presented in the "Example Data" (SAR section 19) above, calculate a BY$ estimate of recurring flyaway costs by applying the quantity stream Old Schedule, New Quantity (Step 1).

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. OLD SCHED NEW QUANTITY	0	12	24	0	0	12	12	12	24	30	30	30	30	2	0	0	218
Applying these Qtys to the baseline curve yields the following:																	
2. BY$ recurring flyaway based on the Old schedule & New Quantity	0.0	134.5	197	0.0	0.0	87.3	83	79.7	152	179.7	171.2	167.7	159.4	10.5	0.0	0.0	1419.0

SELECTED ACQUISITION REPORT (SAR) COURSE

Quantity Variance

Step 8: Using the baseline cost-quantity data presented in the "Example Data" (SAR section 19) above, calculate a BY$ estimate of recurring flyaway costs by applying the quantity stream old quantity and the old schedule data.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. OLD SCHED OLD QUANTITY	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
Applying these Qtys to the baseline curve yields the following:																	
2. BY$ recurring flyaway based on the Old schedule & Old Quantity	0	134.5	197	0	0	87.3	83	79.7	152	179.7	171.2	164.7	159.4	10.5	0.0	0.0	1674.7

Step 9: Compute BY$ True Quantity Variance by subtracting the recurring flyaway estimate you calculated in Step 8 from the estimate calculated in Step 7.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. BY$ recur flyaway Old Schedule & New Quantity	0.0	134.5	197	0.0	0.0	87.3	83	79.7	152	179.7	171.2	164.7	159.4	10.5	0.0	0.0	1419.0
2. *less*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	
3. BY$ recurring flyaway based on the Old Schedule & Old Quantity	0.0	134.5	197	0.0	0.0	87.3	83	79.7	152	179.7	171.2	164.7	159.4	155	111.2	0.0	1674.7
4. = BY$ True Quantity Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	-144.5	-111.2	0	-255.7

Step 10: Compute TY$ True Quantity Variance by multiplying BY$ True Quantity Variance (Step 9) by the current set of indices.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2004	TOTAI
1. BY$ True Quantity Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	-144.5	-111.2	0	-255.7
2. Multiplied by	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	
3. Current SAR's Indices	1.1521	1.2022	1.2506	1.2945	1.3337	1.3684	1.4056	1.4454	1.4879	1.5323	1.5783	1.6257	1.6744	1.7247	1.7764	1.8297	
4. = TY$ True Quantity Var.	0	0	0	0	0	0	0	0	0	0	0	0	0	-249.22	-197.54	0	-446.8

Quantity Variance

Summary

We have calculated two quantity variance answers:

	BY$	TY$
Total Quantity Variance	-430.0	-751.3
True Quantity Variance	-255.7	-446.8

Total Quantity Variance is the variance resulting from the decrease in the number of end items.

True Quantity Variance is the variance to be reported in the SAR as the effect of the change in the number.

The difference between these two values must be allocated or distributed to the variance categories that have caused the SAR baseline cost quantity data to differ from the previous SAR's cost quantity data. This allocation process is explained in the next section of this handbook.

CARS COMPUTATIONAL MODEL NOTES

The Computational Model's calculation of Quantity Variance follows the same computational process outlined above.

The user is given the option of allowing the model to automatically calculate quantity variance or the user can manually prepare and enter the necessary data streams.

Manual preparation and entry of this data may be necessary in cases where the PCE cost-quantity curve calculated from all the program years recurring flyaway data will produce misleading answers. This would be the case of mature programs whose history includes several versions of the same weapons system and the earlier versions were priced very differently than the current version. In this case the preparer should create a PCE cost-quantity curve from only the relevant recurring flyaway data.

In the Automatic Calculation mode, the model will create a PCE cost-quantity curve from the previous SAR's subsection 16b. data. It will create a SAR baseline cost-quantity curve from SAR subsection 19.f data. The quantity streams New Schedule, Old Quantity or Old Schedule, New Quantity are calculated and utilized by the model.

DEFINITION AND EXPLANATION

As noted in the Quantity Variance section of this handbook, all quantity changes will be based on the current SAR baseline (PE, DE, or PdE) cost-quantity curves. During the Quantity variance calculation we also computed Total Quantity Variance from the PCE cost-quantity curve in order to account for all the Program changes associated with the new quantity. The difference between the cost of the quantity change based on the current SAR baseline cost-quantity curve and the cost based on the PCE cost-quantity curve must now be assigned to Schedule, Engineering, Estimating or Other categories, (i.e., the flyaway categories) as appropriate. These are the only variance categories that could cause the shift of the cost-quantity curve since the baseline was established.

Therefore, when there is a difference between these two cost-quantity curves, this difference is not classified as quantity change, but instead it is allocated to the variance categories that historically caused the difference.

Quantity Variance

Mathematical Procedure

It is important to note that, as in the case of Economic Adjustments, a Quantity Allocation is only a reclassification or shifting of some of the variance values you have previously calculated. Total variance will not change as a result of this allocation process.

A Quantity Allocation must be performed if a quantity change occurred and if the SAR baseline cost-quantity curve is different from the PCE cost quantity curve.

The amount to allocate is computed in both base-year and then-year dollars by comparing the Quantity Variance results derived by applying the quantity data to the two cost-quantity curves. The differences are the amount to allocate in base-year and then-year dollars.

This amount is then allocated to the four variance categories (Schedule, Engineering, Estimating, and Other) in accordance to degree in which each category (i.e., previous changes) has historically contributed to the shift in the cost-quantity curve.

Quantity Variance

EXAMPLE:

DATA NEEDED	SOURCE
1. Total Quantity Variance(PCE) TY & BY$	1. Qty Var worksheets.-current SAR
2. True Quantity Variance(Baseline) TY & BY$	2. Qty Var worksheets.-current SAR
3. Previous Changes	3. Previous SAR section 13a

Example data:

	BY $	TY $
TOTAL QTY VAR (PCE)	1024.6	1935.2
ACTUAL QTY VAR (BL)	959.6	1811.4
PREV CHANGES (VAR):		
SCHEDULE	0	455.6
ENGINEERING	0	0
ESTIMATING	235.7	345.9
OTHER	0	0
CURRENT CHANGES: (Before Allocation)		
ECONOMIC	N/A	0
QUANTITY	1024.6	1935.2
SCHEDULE	0	117.1
ENGINEERING	296.2	495.2
ESTIMATING	444.1	742.5
OTHER	0	0
SUPPORT	15.4	27.7
TOTAL	1780.3	3317.7

Step 1: Compute the BY$ and TY$ amounts to allocate by utilizing the matrix below:

PCE QTY VAR	BASELINE QTY VAR	AMT. TO ALLOCATE
TY$ 1935.2	1811.4	123.8 (1935.2 - 1811.4)
BY$ 1024.6	959.6	65.0 (1024.6 - 959.6)

Quantity Variance

Step 2: Perform the BY$ allocation using the matrix below:

	Prev Var BY$	Ratio to Total	Amt. to Allocate	Allocation
Schedule	0	0 (0/235.7)	65.0	0
Engineering	0	0 (0/235.7)	65.0	0
Estimating	235.7	100%(235.7/235.7)	65.0	65.0(65.0X1.00)
Other	0	0 (0/235.7)	65.0	0
Total	235.7	100%		65.0

Step 3: Perform the TY$ allocation using the matrix below:

	Prev Var TY$	Ratio to Total	Amt. to Allocate	Allocation
Schedule	455.6	60% (455.6/801.5)	123.8	70.3(123.8X.60)
Engineering	0	0	123.8	0
Estimating	345.9	40%(345.9/801.5)	123.8	53.5(123.8X.40)
Other	0	0	123.8	0
Total	801.5	100%		123.8

Step 4: Allocate the BY$ individual amounts to variance categories:

	BY $ VAR before Allocation	BY$ Allocation	BY $ VAR after Allocation
ECONOMIC	N/A	N/A	N/A
QUANTITY	1024.6	-65.0	959.6
SCHEDULE	0	0	0
ENGINEERING	296.2	0	296.2
ESTIMATING	444.1	+65.0	509.1
OTHER	0	0	0
SUPPORT	15.4	0	15.4
TOTALS	1780.3	0	1780.3

Step 5: Allocate the TY$ individual amounts to variance categories:

	TY $ VAR before Allocation	TY$ Allocation	TY $ VAR After Allocation
ECONOMIC	0	0	0
QUANTITY	1935.2	-123.8	1811.4
SCHEDULE	117.1	+70.3	187.4
ENGINEERING	495.2	0	495.2
ESTIMATING	742.5	+53.5	796.0
OTHER	0	0	0
SUPPORT	27.7	0	27.7
TOTALS	3317.7	0	3317.7

Quantity Variance

CARS COMPUTATIONAL MODEL NOTES

- The Computational Model's calculation of Quantity Allocation follows the same computational process outlined above.
- The computational path outlined above is the "normal case or default" method. The model also provides the opportunity to select which of the four possible variance categories will accept the allocation. This is used when the preparer knows exactly which of the categories was responsible for the shift in the curve.
- The worksheets and summary screens of the computational model provide the user with a view of the data inputs necessary to calculate Quantity Allocation and the final results of these computations. The Reports section of CARS will provide the user with a step-by-step record of the model's calculation of this allocation.

Schedule Variance

DEFINITION AND EXPLANATION

Schedule Variance is a cost change due to a shift in a procurement or delivery schedule, completion date or intermediate milestone for development or production. In simpler terms, Schedule Variance is a change in the fiscal year profile of any WBS element contained in flyaway costs. Unlike Quantity Variance, it is not limited to reportable end items.

Schedule changes in support items are not included; they are categorized as support changes.

MATHEMATICAL PROCEDURE

Schedule Variance should be calculated whenever a program experiences a change in any of the quantities per fiscal year of the reportable end item or any other item in the recurring flyaway section of the WBS. It should also be calculated when there is a schedule shift in the yearly values of the funding profile of any element of non-recurring flyaway costs.

All computations involved in determining Schedule Variance are performed in base-year dollars. The resulting variance is converted to then-year dollars by multiplying base-year dollar values by the current set of indices.

Schedule Variance is calculated in three separate parts:

RECURRING FLYAWAY
The first step is to calculate schedule variance for recurring flyaway costs. This step is performed in base-year dollars using the PCE recurring flyaway cost-quantity curve. The PCE curve is used because it allows us to isolate our analysis, free from the effects of this SAR period's Engineering, Estimating and Other changes.

When a program has experienced both a schedule and a quantity change, there are two separate paths these calculations will follow, depending on whether the program has experienced a positive or negative quantity change.

Note: Different computational paths for quantity increases and decreases are a result of a recent change in guidance from OSD. This change in methodology was necessitated by the severe cut backs in procurement quantities experienced by many weapons programs. The old method of computing Schedule Variance provided an acceptable answer in cases where the program had experienced a quantity increase or a mild quantity decrease; however, this method tended to understate the effect of quantity change and overstate the
effect of an accompanying schedule change in programs experiencing large scale cut backs in quantity.

Schedule Variance

Schedule Variance Calculations For Recurring Flyaway Costs In Cases Of A Schedule Change With No Accompanying Quantity Change Or Schedule Change With An Accompanying Quantity Increase:

Step 1: Compute a cost-quantity curve (PCE) from the previous SAR's quantity and BY$ recurring flyaway data. The resulting first unit cost (T1) and slope will be used throughout these Schedule Variance calculations.

Step 2: Compute the quantity stream New Schedule, Old Quantity as detailed in the Quantity Variance section of this manual.

Step 3: Apply the quantity stream New Schedule, Old Quantity (Step 2) to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 4: Subtract from the cost estimate New Schedule, Old Quantity (Step 3), the cost estimate Old Schedule, Old Quantity. Old Schedule, Old Quantity is simply the recurring costs from your previous SAR as arranged in section 16b. The resulting cost stream is Schedule Variance in BY$ for recurring flyaway costs.

Note that by comparing New Schedule, Old Quantity to Old Schedule, Old Quantity we have held the effect of quantity constant (Old Vs Old) and thus have isolated the effect of the schedule change (New Vs Old).

Step 5: Calculate Recurring Flyaway Schedule Variance TY$ by multiplying the BY$ Schedule Variance figures (Step 6) by the current set of price indices.

Note: Because we are holding the effect of quantity constant, the difference between these two resulting cost streams is BY$ Schedule Variance. Normally these calculations will result in a BY$ variance total of zero. Each cost stream will have the dollars arranged differently year-by-year but the differences will sum to zero. To calculate the TY$ value of the Schedule Variance, the individual yearly differences are multiplied by the current set of indices. This is the normal case with Schedule Variance, i.e., to have a zero change in BY$ and a non-zero change in TY$.

Schedule Variance Calculations For Recurring Flyaway Costs In Cases Of A Schedule Change With An Accompanying Quantity Decrease.

Step 1: Compute a cost-quantity curve (PCE) from the previous SAR's quantity and BY$ recurring flyaway data. The resulting first unit cost and slope will be used throughout these Schedule Variance calculations.

Step 2: Compute the quantity stream Old Schedule, New Quantity as detailed in the Quantity Variance section of this manual.

Step 3: Apply this quantity stream Old Schedule, New Quantity to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Step 4: Apply the quantity stream New Schedule, New Quantity to the PCE cost-quantity curve. A recurring flyaway cost estimate in BY$ results from this action.

Schedule Variance

Step 5: Subtract from the cost estimate, New Schedule, New Quantity (Step 5) the cost estimate Old Schedule, New Quantity (Step 3). The resulting cost stream is Schedule Variance in BY$ for recurring flyaway costs. Note that by comparing New Schedule, New Quantity to Old Schedule, New Quantity we have held the effect of quantity constant (New Vs New) and thus have isolated the effect of the schedule change (New Vs Old).

Step 6: Calculate recurring flyaway Schedule Variance TY$ by multiplying the BY$ Schedule Variance figures (Step 6) by the current set of price indices.

Note: Because we are holding the effect of quantity constant, the difference between these two resulting cost streams is Schedule Variance in BY$. Normally these calculations will result in a BY$ variance total of zero. Each cost stream will have the dollars arranged differently year-by-year but the differences will sum to zero. To calculate the TY$ value of the Schedule Variance, the individual yearly differences are multiplied by the current set of indices. This is the normal case with Schedule Variance, i.e., to have a zero change in BY$ and a non-zero change in TY$.

NON-RECURRING FLYAWAY

The second step is to calculate schedule variance for non-recurring flyaway costs.
This step is performed in BY$ using the PCE non-recurring flyaway cost-quantity curve. This PCE data is used because it allows us to isolate our analysis, free from the effects of this SAR period's Engineering, Estimating and Other changes.

Step 1: Arrange the previous current estimate non-recurring costs as found in subsection 16b. of the previous SAR on the new schedule. This simply means that beginning with the first year of the new schedule place the first program year's non-recurring data and continue until all these yearly values are entered.

Step 2: From the cost stream created in Step1, subtract these same PCE non-recurring costs arranged on the old schedule. This is the same arrangement of PCE non-recurring data as found in the previous SAR's subsection 16b. The resulting cost stream is Schedule Variance in BY$ for non-recurring flyaway costs.

Step 3: Calculate non-recurring flyaway Schedule Variance TY$ by multiplying the BY$ Schedule Variance figures (Step 2) by the current set of price indices.

BASE-YEAR DOLLAR CHANGE ASSOCIATED WITH THE CHANGE IN SCHEDULE.

The third and final step in the calculation of Schedule Variance is the addition of any BY$ change associated with the change in schedule. These are actual dollar costs that result from changing the schedule. An example would be a contract penalty incurred for cutting back the quantity to be purchased in a program year that is under contract. The source of this cost change data is normally the program office cost analyst.

SELECTED ACQUISITION REPORT (SAR) COURSE

Schedule Variance

The following table lists the data needed to compute Schedule Variance and the sources of that data:

DATA NEEDED	SOURCE
1. Current estimate of reportable end items quantities and their schedule.	1. Congressional Data Sheets
2. Previous current estimate of reportable end items quantities and their schedule.	2. Previous SAR's Section 16b.
3. Previous current estimate of recurring flyaway costs in Base-year $	3. Previous SAR's Section 16b.
4. Current SAR Indices.	4. PEO.

Example data:

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
PCE END ITEM QTY./SCHED.	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
PCE BY$ RECUR. FLYAWAY	0.0	186.1	314.5	0.0	0.0	185.6	141.0	127.5	239.0	282.3	278.6	273.1	268.6	245.7	183.9	0.0	2725.9
CE END ITEM QTY./SCHED.	0	12	24	0	0	12	12	12	12	12	12	12	24	24	24	26	218
NEW INDICES	1.1521	1.2022	1.2506	1.2945	1.3337	1.3684	1.4056	1.4454	1.4879	1.5323	1.5783	1.6257	1.6744	1.7247	1.7764	1.8297	

Step 1: Compute a cost-quantity curve from the previous SAR's recurring flyaway data. The resulting T1 and Slope will be used to calculate Total Quantity Variance.

Data Input:

PCE END ITEM QTY/SCHED	0	12	24	0	0	12	12	12	24	30	30	30	30	30	22	0	268
PCE BY$ RECUR. FLYAWAY	0.0	186.1	314.5	0.0	0.0	185.6	141.0	127.5	239.0	282.3	278.6	273.1	268.6	245.7	183.9	0.0	2725.9

Result: First unit cost - - $23.0255 million Slope - - 88.3133%

Step 2: Using the PCE cost-quantity data computed in Step 1, calculate a BY$ estimate of recurring flyaway costs by applying the <u>new quantity</u> data arranged according to the <u>new schedule</u>.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. NEW SCHEDULE NEW QUANTITY	0	12	24	0	0	12	12	12	12	12	12	12	24	24	24	26	218
Applying these Qtys to the PCE curve yields the following:																	
2. BY$ Recurring Flyaway based on the New schedule & New Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	126.4	123.2	120.5	118.1	230.2	223.4	217.7	230.4	2317.7

Schedule Variance

Step 3: Compute BY$ Schedule Variance by subtracting your previous SAR's recurring flyaway data. (Old Schedule, Old Quantity) from the recurring flyaway data you calculated in Step 2, line 2 (New Schedule, New quantity).

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
.. BY$ Recurring Flyaway based																	
ın New schedule & New Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	126.4	123.2	120.5	118.1	230.2	223.4	217.7	230.4	2317.7
?. *less*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	
;. BY$ Recurring Flyaway																	2747.7
)ld schedule & Old Quantity	0.0	207.1	314.3	0.0	0.0	141.2	135.0	130.2	249.6	296.9	284.4	274.7	266.8	260.3	187.2	0.0	
;. = BY$ Schedule Variance	0	0	0	0	0	0	0	0	-123.2	-173.4	-163.9	-156.6	-36.6	-36.9	30.5	230.4	-430

Step 4: Compute TY$ Schedule Variance by multiplying BY$ Schedule Variance (Step 4, line 4) by the current set of indices.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
.. BY$ Schedule Variance	0	0	0	0	0	0	0	0	-123.2	-173.4	-163.9	-156.6	-36.6	-36.9	30.5	230.4	-430
?. *Multiplied by*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	*(X)*	
;. Current SAR's Indices	1.1521	1.2022	1.2506	1.2945	1.3337	1.3684	1.4056	1.4454	1.4879	1.5323	1.5783	1.6257	1.6744	1.7247	1.7764	1.8297	
;. = TY$ Schedule Variance	0	0	0	0	0	0	0	0	-178	-265.7	-258.7	-254.6	-61.3	-63.4	54.2	421.6	-605.9

CARS COMPUTATIONAL MODEL NOTES

- The Computational Model provides the user with the option of manually computing Schedule Variance or allowing the model to automatically compute this variance.
- With the manual option users are prompted on Worksheet 4 to enter the cost streams necessary to compute Schedule Variance. It is assumed the user will calculate these values off-line. The advantage to the manual method is that the user can compute a cost stream by calculating separate cost-quantity curves and factors for each of the WBS elements in their recurring flyaway estimates. (The automatic mode uses a composite curve.)
- In the automatic mode, the models draws all the data it needs from section 16b. of the previous and current SARs. The model will calculate Schedule Variance using a composite cost-quantity curve.

The worksheets and summary screens of the computational model provide the user with a view of the data inputs necessary to calculate Schedule Variance and the final results of these computations. The Reports section of CARS will provide the

ADJUSTMENT FOR CURRENT & PRIOR ESCALATION

DEFINITION AND EXPLANATION

Adjustment for Current and Prior Escalation is a variance that results from changes in inflation rates for current and prior years. It is related to the Economic change because that calculation is derived from current and prior year inflation rates. When these indices change for current and prior years, an adjustment needs to be made because the then-year dollars for the current and prior years have already been appropriated and are fixed. This requires an offset in then-year dollars (the mathematical inverse of the Economic change for current and prior years) and the associated change in base-year dollars. The resulting change is categorized as Estimating (for flyaway changes) or Support, as appropriate.

Adjustment for Current and Prior Escalation is listed as a separate variance element within the Estimating and Support variance categories in subsection 13b. It should be given the explanation, "Adjustment for current and prior escalation."

MATHEMATICAL PROCEDURE

The adjustment for Current and Prior Escalation is calculated in two parts, support and flyaway. We must first calculate economic variance for the support portion of the appropriation. Then the Adjustment for Prior and Current Escalation for support is the inverse [opposite mathematical sign (+)(-)] of this portion of economic variance for those years prior to and including the current fiscal year. This will result in the then-year dollar value of the support portion of the offset. To calculate the base-year value, divide the then-year values by the current set of inflation indices.

The offset for the flyaway portion of economic variance is computed as an Estimating change. First calculate economic variance for the flyaway portion of the appropriation; then, the Adjustment for Prior and Current Escalation for flyaway is the inverse [opposite mathematical sign (+)(-)] of this portion of economic variance for those years prior to and including the current fiscal year. This will result in the then-year dollar value of this portion of the offset and it will be reported as Estimating variance. To calculate the base-year value, divide the then-year values by the current set of inflation indices.

EXAMPLE*:*

DATA NEEDED	SOURCE
1. Previous current estimate in BY$ for Total Apn.	1. Previous SAR subsection 16b
2. Previous current estimate in BY$ for Flyaway costs.	2. Previous SAR's worksheets.
3. Previous current estimate in BY$ for Support costs.	3. Previous SAR's worksheets.
4. Previous SAR's Indices.	4. Previous SAR's worksheets.
5. Current SAR's Indices.	5. PEO.

SELECTED ACQUISITION REPORT (SAR) COURSE

Example data:

	1998	1999	2000	2001	2002	2003	TOTAL
Prev. CE Total Apn BY$	1680.6	2468.4	3576.5	2772.3	2456.0	1104.8	14058.6
Prev. CE Flyaway BY$	1305.4	1850.9	2781.9	2408.3	2209.7	1040.8	11597.0
Prev. CE Support BY$	375.2	617.5	794.6	364.0	246.3	64.0	2461.6
Previous SAR's Indices	1.3130	1.3920	1.4760	1.5650	1.6580	1.7150	
Current SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
Current Fiscal Year	1999						

Economic Variance for the current period was calculated to be:

	1998	1999	2000	2001	2002	2003	TOTAL
Economic Variance	40.3	71.6	114.4	94.3	90.9	43.1	454.6

Because the current fiscal year is 1999, an adjustment must be made to "back-out" the economic variance computed for those program years up to and including 1999.

Step 1: Calculate Economic variance on the Flyaway portion of this program.

	1998	1999	2000	2001	2002	2003	TOTAL
1. PCE BY Flyaway costs $	1305.4	1850.9	2781.9	2408.3	2209.7	1040.8	11597.0
2. Multiplied by	(X)	(X)	(X)	(X)	(X)	(X)	
3. Current SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
4. = PCE TY$ (new indices)	1745.3	2630.1	4195.1	3850.9	3745.4	1825.6	17992.4
5. PCE BY Flyaway costs $	1305.4	1850.9	2781.9	2408.3	2209.7	1040.8	11597.0
6. Multiplied by	(X)	(X)	(X)	(X)	(X)	(X)	
7. Previous SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
8. = PCE TY$ (old indices)	1714.0	2576.5	4106.1	3769.0	3663.7	1785.0	17614.2
Econ Variance - Flyaway(4-8)	31.3	53.7	89.0	81.9	81.8	40.6	378.3

Step 2: Calculate the TY$ Adjustment for Current and Prior Escalation of the flyaway portion of economic variance. This will be classified as an Estimating variance.

	1998	1999	2000	2001	2002	2003	TOTAL
1. Econ Variance - Flyaway	31.3	53.7	89.0	81.9	81.8	40.6	378.3
2. Current and Prior	31.3	53.7	NA	NA	NA	NA	
3. Apply the math inverse to values in Step2	(-)	(-)	NA	NA	NA	NA	
4. Adjust. for Current and Prior Escal.-Estimating Variance TY	-31.3	-53.7	0	0	0	0	-85.0

Step 3: Calculate the BY$ Adjustment for Current and Prior Escalation of the flyaway portion of economic variance.

	1998	1999	2000	2001	2002	2003	TOTAL
1. Adjust. for Current and Prior Escal.-Estimating Variance TY	-31.3	-53.7	0	0	0	0	-85.0
2. divided by	(/)	(/)	(/)	(/)	(/)	(/)	
3. Current SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
4. =Adjust. for Current and Prior Escal.-Estimating Variance BY	-23.4	-37.8					-61.2

Step 4: Calculate Economic variance on the Support portion of this program.

	1998	1999	2000	2001	2002	2003	TOTAL
1. Prev. CE Support BY$	375.2	617.5	794.6	364.0	246.3	64.0	2461.6
2. Multiplied by	(X)	(X)	(X)	(X)	(X)	(X)	
3. Current SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
4. = PCE TY$ (new indices)	501.6	877.5	1198.3	582.0	417.5	112.3	3689.1
5. PCE BY Support costs $	375.2	617.5	794.6	364.0	246.3	64.0	2461.6
6. Multiplied by	(X)	(X)	(X)	(X)	(X)	(X)	
7. Previous SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
8. = PCE TY$ (old indices)	492.6	859.6	1172.8	569.7	408.4	109.8	3612.9
Econ Variance - Support (4-8)	9.0	17.9	25.4	12.4	9.1	2.5	76.3

Step 5: Calculate the TY$ Adjustment for Current and Prior Escalation of the support portion of economic variance. This will be classified as an Support variance.

	1998	1999	2000	2001	2002	2003	TOTAL
1. Econ Variance - Support	9.0	17.9	25.4	12.4	9.1	2.5	76.3
2. Current and Prior	9.0	17.9	NA	NA	NA	NA	
3. Apply the math inverse to values in Step2	(-)	(-)	NA	NA	NA	NA	
4. Adjust. for Current and Prior Escal.-Estimating Variance TY	-9.0	-17.9	0	0	0	0	-26.9

Step 6: Calculate the BY$ Adjustment for Current and Prior Escalation of the support portion of economic variance.

	1998	1999	2000	2001	2002	2003	TOTAL
1. Adjust. for Current and Prior Escal.-Estimating Variance TY	-9.0	-17.9	0	0	0	0	-26.9
2. divided by	(/)	(/)	(/)	(/)	(/)	(/)	
3. Current SAR's Indices	1.3370	1.4210	1.5080	1.5990	1.6950	1.7540	
4. =Adjust. for Current and Prior Escal.-Estimating Variance BY	-6.7	-12.6					-19.3

CARS COMPUTATIONAL MODEL NOTES

The Computational Model automatically calculates this adjustment for current and prior escalation. The results can not be edited by the user.

ECONOMIC ADJUSTMENT FOR NEGATIVE PROGRAM CHANGE

DEFINITION AND EXPLANATION

Negative program change is a cost reduction in any variance category except economic. The then-year dollar cost of your program has two components, the original base-year value and the escalation that has been added to it. Therefore when a cost reduction occurs, a portion of the then-year dollar value of the reduction must be classified as economic change. You had previously reported economic change; now a portion of the program on which you based the computation of this economic change has been deleted so an adjustment is necessary.

MATHEMATICAL PROCEDURE

It is important to note that an Economic Adjustment is only a reclassification or shifting of some of the variance values you have previously calculated. Total variance will not change as a result of this adjustment process.

Economic Adjustment for Negative Program Change is computed after the SAR preparer has calculated all of the individual cost variance categories. All calculations are performed using the total variance for each individual variance category not the year-by-year values. This adjustment process is performed if Negative Program Change is found in any of the cost variance categories (except economic).

While it is relatively easy to understand the need for this adjustment, the identification of the exact amount of economic change associated with any given program reduction can be very difficult. For this reason, DoD 7000.3-G allows the use of any method of computation that provides a "reasonable and rational approximation of the required economic change."

The most common method uses a process that establishes a ratio between previous economic change and total program escalation. This ratio is applied to the amount of the negative program changes to arrive at the adjustment to economic variance.

EXAMPLE*:*

DATA NEEDED	SOURCE
1. Individual Variance totals in both TY and BY dollars	1. Variance computation worksheets for the current SAR reporting period
2. Previous Economic Variance	2. Previous SAR section 13.a
3. PCE TY$ total appropriation	3. Previous SAR section 16b.
4. PCE BY$ total appropriation	4. Previous SAR section 16b.

Example data:

Previous Economic Variance = -609.4
PCE TY$ total appropriation = 5629.8
PCE BY$ total appropriation =3888.0
Summary of Individual Variances for THIS SAR period (i.e., current changes) before Economic Adjustment for Negative Program Change:

	BY$	TY$
ECONOMIC	N/A	157.9
QUANTITY	-430.0	-751.3
SCHEDULE	0.0	139.3
ENGINEERING	43.8	61.6
ESTIMATING	132.8	218.8
OTHER	0.0	0.0
SUPPORT	172.9	-248.0

Step 1: Compute Total Economic Variance by adding current economic variance to prior economic variance.

1. Prior Economic Variance	-609.4
Plus	(+)
2. Current Economic Variance	157.9
3. = Total Economic Variance	-451.5

Step 2: Compute Prior Escalation by subtracting PCE BY$ from PCE TY$.

1. PCE TY$ Total Apn.	5629.8
Less	(-)
2. PCE BY$ Total Apn	3888.0
3. = Prior Escalation	1741.8

Step 3: Compute Total Escalation by adding Current Economic Variance to Prior Escalation (Step 2, line 3).

1. Prior Escalation	1741.8
plus	(+)
2. Current Economic Variance	157.9
3. = Total Escalation	1899.7

Step 4: Compute the ratio of Total Economic Variance to Total Escalation by dividing Total Economic Variance by Total Escalation.

1. Total Economic Variance	-451.5
divided by	(/)
2. Total Escalation	1899.7
3. = Ratio of Econ Var to Tot Escal.	-0.23767

Step 5: Calculate the escalation associated with each variance category that experienced a negative program change by subtracting the BY$ variance from the TY$ variance. Sum as a total (negative program change categories only).

	BY $	TY $	TY $ LESS BY$
ECONOMIC	N/A	157.9	N/A
QUANTITY	-430.0	-751.3	-321.3
SCHEDULE	0.0	139.3	+
ENGINEERING	43.8	61.6	+
ESTIMATING	132.8	218.8	+
OTHER	0.0	0.0	+
SUPPORT	-172.9	-248.0	-75.1
TOTAL ESCALATION			-396.4

Step 6: Compute each escalation value (negative program change categories only) as a percentage of Total Escalation.

	Escalation	Percent	Calculation
ECONOMIC			
QUANTITY	-321.3	81%	-321.3 / -396.4
SCHEDULE			
ENGINEERING			
ESTIMATING			
OTHER			
SUPPORT	-75.1	19%	-75.1 / -396.4
TOTAL ESCALATION CHANGE = -396.4			

Step 7: Compute the total amount of the Economic Adjustment by multiplying each Escalation by the Ratio of Economic Variance to Total Escalation.

1. Total Escalation Change	-396.4
multiplied by	(x)
2. ratio of Econ var. to tot. Escal	-0.23767
3. = Total amount of adjustment	-94.21

Step 8: Compute the individual variance amount of the economic adjustment by the percentages calculated in Step 6 by the total amount of the adjustment.

	Ind. Adj.	Percent	Calculation
ECONOMIC			
QUANTITY	-76.3	81%	-94.21 (X) .81
SCHEDULE			
ENGINEERING			
ESTIMATING			
OTHER			
SUPPORT	-17.9	19%	-94.21 (X) .19
TOT. ECON. ADJUSTMENT	-94.2		

Step 9: Compute the adjusted TY$ variances by applying the calculated adjustments in the following manner: Economic variance is changed by adding the total amount of the adjustment using the same mathematical sign (+ or -) as resulted from the calculations. This amount is added to the economic variance you computed by applying the new set of indices. The mathematical inverse of the individual economic adjustments are added to the appropriate unadjusted variances (e.g., Quantity and Support). The inverse is added because this is an offset to the variances previously calculated. You are not changing the original total variance amount, instead you are rearranging the computed variance values.

	TY $ UNADJ*	ECONOMIC ADJUSTMENT	TY $ ADJUSTED VARIANCES
ECONOMIC	157.9	94.2	252.1
QUANTITY	-446.7	-76.4	-523.1
SCHEDULE	30.6	-	30.6
ENGINEERING	-65.4	-	-65.4
ESTIMATING	149.9	-	149.9
OTHER	0.0	-	0.0
SUPPORT	-248	-17.8	-265.8
TOTALS	-421.7	0.0	-421.7

CARS COMPUTATIONAL MODEL NOTES

- The Computational Model's calculation of Economic Adjustment for Negative Program Change follows the same computational process outlined above.

- The computational path outlined above is the "normal case or default" method. It presumes the user can not identify the exact amount of economic escalation associated with a given negative program change. In cases where the user can identify this economic escalation, the model prompts the user for the amount of previous economic change to be used in developing the ratio. In the cases where the exact amount of escalation associated with the negative change can be identified, this fine-tuning feature results in a more accurate computation.

The worksheets and summary screens of the Computational Model provide the user with a view of the data inputs necessary to calculate Economic Adjustment for Negative Program Change and the final results of these computations. The Reports section of CARS will provide the user with a step-by-step record of the model's calculation of this adjustment.