**Chapter 11**

**Inferences About Population Variances**

**Case Problem: Air Force Training Program**

Some descriptive statistics about the current and proposed methods are as follows:

Variable N Mean SE Mean StDev

Current 61 75.066 0.505 3.945

Proposed 61 75.426 0.321 2.506

Minimum Q1 Median Q3 Maximum

65.000 72.000 76.000 78.000 84.000

69.000 74.000 76.000 77.000 82.000

The sample mean of 75.066 and 75.426 hours show that both methods have approximately the same mean completion time. The standard deviations of 3.945 hours for the current method and 2.506 hours for the proposed method show the proposed method has less variation.

A test of the difference between population means with H0: **1 - **2 = 0 has a *t* value of -.60 and

a corresponding *p*-value of .548. Thus, at *α* = .05, the null hypothesis cannot be rejected. The sample evidence does not indicate the methods differ in terms of mean completion times. The 95% confidence interval estimate of the difference between two population means is -1.55 to .83 hours.

The standard deviations and variances of the two methods are as follows:

Current Proposed

Standard Deviations 3.945 2.506

Variance 15.562 6.282

Degrees of Freedom 60 60

For the hypothesis test , we find .

Using the *F* tables, *F* is greater than *F*.01 = 1.84. Thus, the area in the upper tail is less than .01 indicating the two-tail *p*-value must be less than .02. Minitab or Excel show *p*-value = .0006. With *p*-value .05, H0 is rejected; we can conclude that the two methods differ in terms of variance. The data show the proposed method has the smaller variance indicating that students trained under this method are more consistent in terms of completion time.

Based on the data available, the proposed method is preferred. The two methods are very close in terms of mean completion times with the 95% confidence interval of the difference being -1.55 to 0.83 hours. However, the proposed method has a significantly lower variance. Under the proposed method, students are more likely to complete the training in approximately the same amount of time. There should be less chance of faster students waiting for slower students to complete the training.

Before making a final decision, we recommend that data be collected on the amount of learning under the two methods. The time data favors switching to the proposed method. However, is the quality of the training with the proposed method the same or better than the quality of the training with the current method? Both groups could be given an examination at the end of the training program. Analysis of the examination scores would determine if the programs were similar or different in terms of the amount of learning provided by the programs. This analysis should be made prior to the final decision to switch to the proposed method.