I INTRODUCTION AND SCOPE

SRI International has designed, fabricated, and delivered two portable instrument systems to Shook, Hardy & Bacon. These systems are designed to measure carbon monoxide (CO), and to take filter samples for determining the concentration of nicotine in ambient air.

This proposal has been requested by the client to cover the completion of tasks already started and to perform new research tasks. The five tasks in this proposal are:

Task 1: Completion of Operations Manual and Final Report.

This task covers the completion of each document in draft form and the finalization of each in printed form.

Task 2: Modification of Two Portable Instrument Systems.

This task entails modifications that the client feels are desirable to simplify transport and operation of the systems.

Task 3: Validation of Filter Pretreatment Procedures.

This involves the validation of a procedure for chemically pretreating the filters to prevent the loss of nicotine during long-duration sampling.

Task 4: Development of an Analytical Procedure for Nicotine.

SRI has developed an analytical procedure for nicotine using a gas chromatograph/mass spectrometer (GC/MS). This task is to develop a technique with equivalent sensitivity that uses less sophisticated and expensive equipment.

Task 5: Performance of Additional Field Tests.

This task involves obtaining the most reliable data possible using the pretreated filters developed in Task 3.

Each of these tasks is discussed separately in the five succeeding sections of this proposal. Each section contains a statement of the work to be performed with an estimate of the cost and time required to perform each task.

SRI recommends that the tasks be given priority for funding in the order in which they are presented. A finalization of the draft report and draft manual should be delayed, however, until all other tasks are completed.

Any of all of these tasks can be accepted by a letter from Shook, Hardy & Bacon modifying the existing contract with SRI (SRI Project 4931). The prices established for each task are our best estimates of the cost. We would not exceed those prices without your approal.

This proposal will remain in effect until 16 March 1979. If more time is required, SRI International will consider a request for an extension.

II TASK 1: COMPLETION OF OPERATIONS MANUAL AND FINAL REPORT

SRI has estimated the time and costs required to review the existing portions of the draft manual and the draft final report, complete the missing sections, and retype them in draft form. This estimate also covers the production of the manual and report in final form after they have been returned from your reviewers.

Most of the figures in the drafts will be hand drawn. All figures in the final versions will be prepared by a draftsman.

The draft manual will include the pretreatment procedure recommended by Dr. William Clapp of Reynolds. Although there will be a brief discussion of the potential need for this pretreatment, we will state that SRI has not validated the pretreatment procedure. This section in the draft manual may be eliminated, modified, or retained in the final form of the operations manual to reflect the results of additional work completed before the manual is finalized.

The nicotine analysis procedures using the gas chromatograph/mass spectrometer will be included in the form in which they were developed by SRI. If the client exercises the option to develop an analytical procedure using a nitrogen-selective detector (Task 4), the description of that method can be added to the draft manual after that work has been completed. The cost of modifying the draft manual is included in the proposal to develop a new analytical procedure for nicotine. If work on a pretreatment procedure or a new analytical procedure is authorized, SRI recommends that the finalization of the manual be delayed until that work can be included. Also, if the suitcase is modified to include a CO zero-gas system, the draft manual should reflect that development.

The draft report will include a discussion of the potential need for pretreatment of the nicotine filters to ensure quantitative collection. However, there will be no discussion of specific procedures, because none has been tested by SRI. This section may also be eliminated, modified, or retained, depending on future work in this area.

The results of field tests for nicotine will include a statement that we believe that they are accurate based on our limited testing of nicotine breakthrough. We will state that the field tests were performed to test and validate the equipment, rather than to obtain definitive data on nicotine concentration in public places.

If additional field tests using pretreated filters are to be performed, we recommended that final production of the report be delayed until the data from those tests can be included.

We estimate that it will cost $6,780 and require four weeks to complete the documents from the time we receive authorization to proceed with the work. This will include preparation of a draft manual and a draft report covering the existing system and the work performed to date. (This time estimate is contingent upon the availability of the key authors for the missing sections.) These personnel will be available in late February. We strongly recommend that authorization to proceed with the production of the draft manual and the draft final report be forwarded as soon as possible.

We estimate that the production of the manual and the final report in final form will cost $6,400 and take four weeks from the time we receive all of the requested changes from you. This estimate assumes that we will receive all comments within three months of submitting the draft of the manual and report.

This estimate also assumes that it will take no more than four mandays to make the requested changes and that you will want 10 copies each of the manual and report in final form. If you wish more copies they should be requested before the manual and report go to press.

III TASK 2: MODIFICATION OF TWO PORTABLE INSTRUMENT SYSTEMS

SRI understands that field use of the two suitcase-mounted instrument systems has shown the desirability of performing several modifications of those systems to simplify transport and operation.

The modifications to be completed under Task 2 include the following:

- Install O-ring seals in the filter holders
- Mount new wheels on the suitcases
- Replace the mercury battery in the ALNOR with a power supply
- Remount the printer and other components
- Development and install a CO zero-gas system
- Modify the manual.

The cost to perform these modifications is estimated to be $11,100. We estimate that the modifications can be completed in four weeks after receipt of the suitcases, assuming that the electrical components and the wheels are stock items.

Development and installation of a CO zero-gas system is not trivial. SRI experience indicates that there are two possible approaches to the generation of zero gas. Both are based on the use of catalysts to destroy the CO in the sample air. We propose to perform bench tests of these catalysts using the suitcase pump and CO analyzer. We will zero the analyzer using CO-free air and then test the effectiveness of the catalysts using synthetic air containing known concentrations of CO. This task will be terminated if the bench tests are unsuccessful.

If the bench tests are successful, we propose to install a catalyst bed with a suitable valve that can be operated from outside the suitcase. To operate the zero gas system, the valve would be shifted to the "zero" position and the sample air would be diverted through the catalyst bed before flowing through the CO analyzer. We estimate that a zero reading could be obtained in one minute.

We recommend against the use of a built-in cylinder of zero gas in the suitcase; such cylinders are heavy, bulky, and require either a high-pressure valve or a pressure regulator.

The estimated cost of revising the draft manual given in this proposal includes the cost of rephotographing the inside of the suitcase to show the location of the power supply and the zero-gas system, the revision of the draft manual, and the preparation of additional figures. This estimate

assumes that the development and installation of these systems will be performed before the manual and report are prepared in final form.