EXECUTIVE SUMMARY

This first volume of the Accreditation Support Package (ASP I) is designed to provide a potential user with a characterization of the current state of Suppressor with respect to criteria related to its general acceptability for use. The information collected in this phase should characterize the model well enough to provide an initial determination of its suitability for a particular application. It should also provide sufficient information for a potential user to determine whether the model is well enough managed and supported to yield consistent results across its spectrum of users and applications. The information provided to characterize the subject model consists of the following elements:

a. A description of the configuration management baseline for the model, including version history, current version status, model development policy (including beta site provisions), documentation availability, and a summary of configuration management policies, procedures, guidelines and support functions in place for the model;

b. A summary of implicit and explicit assumptions and limitations inherent in the model because of its design and/or coding assumptions or structure, as well as any implied constraints to the use of the model that are a consequence of these assumptions or structures. A listing of known errors or anomalies found as a result of prior verification and validation (V&V) efforts is also included;

c. A review of the model's development, V&V and usage histories, as well as a summary of prior accreditations;

d. A review of the status of model documentation and its conformity to accepted software documentation standards, as well as a review of documentation with respect to verification requirements; and

e. A summary of overall software quality as characterized by conformance to accepted design and coding practices.

ASP I provides the details of these information elements in a single document. The degree to which each information element is complete and current provides a general indication of whether the model is suitable for further consideration for use in a particular application.

Configuration Management Baseline: The Suppressor simulation is owned and controlled by the Air Force, Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH. The model is distributed through Science Applications International Corporation (SAIC), located at Dayton, OH.

Distribution of Suppressor is limited to DoD agencies and DoD contractors only. User organizations must sign a beta site agreement with the ASC before receiving the code. Users are allowed to make changes to the source code to meet their own requirements; however, the beta site agreement grants the government unlimited rights to any such modifications or enhancements to the model.

Suppressor CM is performed by the ASC model manager. Users may submit problem reports and change requests to the model manager or model support contractor (SAIC). These requests are then prioritized and implemented to the extent possible with available

funding. Incremental changes made to Suppressor are available to users through the Suppressor Change Distribution System (SCDS) which is a dial-up ftp site located at Wright-Patterson AFB.

The current official baseline is Suppressor 5.4. The distributed software magnetic media contains the source code, command procedures for VAX/VMS and UNIX operating systems, utility programs, and additional files required as the simulation is compiled, linked and executed. A sample fictional combat scenario is included to illustrate the syntax and use of most input data items and generate example model output. Documentation for Suppressor 5.4 is extensive, and consists of a three-volume *User's Guide*, an *Internal Data Structures* description, a *Top Level Design Document*, *Analyst's Manual*, and user's manuals for a database input interface and a graphic interface. All of the documentation is unclassified. The user's guide volumes and *Internal Data Structures* are now available on magnetic media.

Since Suppressor uses generic functions to model the activities of players and systems, the characterization of individual systems is contained in database files. Developing Suppressor scenario data for an actual classified project is eased by preprocessing utilities if standard intelligence products, such as the MSFD, are used. players may be developed using sample players supplemented by threat description documents and other system characterizations. Engagement tactics, describing the interaction of players, probably require the most effort of the database development process. Although ASC has developed some classified databases for internal use, the data sources and assumptions have not been fully documented. Ongoing efforts by ASC/XRA to develop well-documented classified databases should ease the burden on individual users in developing system data for individual projects.

User support functions in place for Suppressor include User's Group meetings, which occur about every other year. Help line assistance and training are provided by the model support contractor.

Although the configuration process for Suppressor is fairly informal, control of the baseline version, incorporation of changes to the baseline, and control of distribution of the baseline and interim changes to authorized users seems to be well managed.

Because of a well-documented baseline, the availability of user training and help resources, and the ongoing development of example databases, users of Suppressor will find a documented, supported baseline for their studies. However, users will need to provide their own resources to fund any model enhancements or additional database development that may be required for their specific application of Suppressor.

Assumptions, Limitations, and Errors: Suppressor is basically an input data base interpreter with very few imbedded assumptions or limitations. There are no restrictions on the type of platforms that can be modeled, for example. Table 1 lists important model

assumptions and limitations generally, throughout the model, and in the implementation of particular functions within Suppressor.

TABLE 1. Assumptions and Limitations for Suppressor 5.4.

Type	Description
General	The orthographic projection is based upon a spherical earth.
	No interpolation of table data is performed in Suppressor.
	The largest geographic area modeled is constrained to a region accurately represented with a Cartesian coordinate system.
	Scenario times are limited by computer word length and thinking time delay but usually have no impact for scenarios of mission level length.
	Distance and position are not resolved to an accuracy greater than 7 digits.
Platform	Platform representations have no physical dimensions.
	The paths and orientation of moving players are modeled using a 3-DOF model with the orientation of the vehicle aligned with the velocity vector.
	A single number is used to represent the acceleration limits of an aircraft.
	Formation tactics are not explicitly modeled.
	Beamwidth, target size, and range are not considered when determining the number of targets sensed.
	Tracking errors are not explicitly modeled.
	Acoustic sensors are not explicitly modeled.
	CM systems which utilize deceptive techniques must be modeled as noise disruptors.
	Sensor data fusion and correlation is assumed to be perfect.
	The experience of a player is not explicitly characterized in Suppressor
	There is never any latency or inaccuracy in a player's self perception.
Environment	Suppressor uses a single loss table for each sensor receiver type.
	The background radiance for infrared or optical sensors detecting a target does not consider the orientation of the sun relative to the sensor and target.
	Only one clutter table can be defined for each sensor type.
	The simulation does model multipath or diffraction.
Command Control and Communication (C3)	There is only one active operating frequency stored and used for each communications network.
	A player designated as the alternate commander must be a subordinate of the original commander.
	Communications can occur only between two players who are in the same command chain; either peer-to-peer, commander-to-immediate subordinate, or subordinate to immediate commander.

Errors are conditions in which a correct model input set will cause a model run to abort or to give an incorrect result. Table 2 lists known errors in Suppressor 5.4.

TABLE 2. Table of Errors for Suppressor 5.4.

Functional Area	Error Description
Platform	The TIME-WINDOW modifier for a planned path can cause path points to be computed with negative speed values. This can cause an infinite loop in the scheduling of sense events for sensors trying to detect this moving target.
Environment	When using variable resolution terrain, there is a potential infinite loop in the line-of-sight algorithm, subroutine TRILOS.
Command Control and Communication (C3)	If a player has two or more communication systems on the same net, the simulation can abort.

V&V Status and Usage History: Suppressor has been used in a number of major studies, and there are currently over 65 registered user sites. Some of the major studies for which Suppressor has been used are briefly described in Table 3.

TABLE 3. Usage History Summary for Suppressor.

Project	Description
Tacit Rainbow COEA	ASC led a study employing an enhanced version of Suppressor for mission effectiveness analysis in support of the Tacit Rainbow Cost and Operational Effectiveness Analysis (COEA). The Tacit Rainbow Program office invested significant resources in Suppressor enhancements.
ASPJ COEA	The Naval Weapons Center (now NAWC-WD) at China Lake led a mission-level effectiveness study to support the AN/ALQ-165 Airborne Self-Protection Jammer (ASPJ) COEA
Tomahawk COEA Model Certification	Suppressor was formally certified for use in the Tomahawk COEA at NAWC-WD, China Lake. Suppressor algorithms and code were reviewed, and results were compared with those of other, previously certified, models. The agreement of results was acceptable. Several Suppressor limitations were identified and subsequently corrected.
B-1B CMUP COEA	The Institute for Defense Analysis (IDA) used Suppressor for analysis in the B-1B Conventional Mission Upgrade Program (CMUP) COEA.
JTAEWS	In 1993, the Deputy Secretary of Defense directed the Air Force and Navy to initiate a study to identify common electronic warfare requirements for tactical aircraft for the next 20 years. The AFSAA led this study and developed an analysis and modeling methodology that used Suppressor for the mission-level effectiveness analysis.
B-1B DSUP Requirements	AFSSA was tasked by the Air Combat Command (ACC) to analyze B-1B ECM requirements for the B-1B Defensive Systems Upgrade Program (DSUP). Suppressor 5.3 was selected for use in this study based upon its previous use and data base development by AFSAA in the JTAEWS. Missions for various snapshots in a Southwest Asian campaign were planned by mission planners on the CENTCOM staff using the Defense Intelligence Agency (DIA)-approved MSFD data base for the year 2005. The primary mission-level Measure of Effectiveness (MOE) was the number of targets at risk for a specified mission success rate.

TABLE 3. Usage History Summary for Suppressor.

Project	Description
RAND Suppression of Enemy Air Defenses (SEAD) Study	Suppressor 5.3 was used by RAND to analyze the relative mission-level effectiveness of several SEAD alternatives for the Air Force. The primary focus of the analysis was to compare the AN/ALR-49 on the F-4G Wild Weasel, the High-Speed Anti-Radiation Missile (HARM) Targeting System (HTS) on the F-16, and the Precision Direction Finding (PDF) system proposed for the F-15, but the relative effectiveness of chaff and self-protection jamming, standoff jamming, HARM, decoys, and combinations of the these alternatives were also examined.
JSOW COEA	NAWC Weapons Division, China Lake used Suppressor to perform the mission-level effectiveness analysis for the Joint Stand-Off Weapon (JSOW) Pre-Planned Product Improvement (P3I) COEA.
JASSM	Suppressor version 5.3 was accredited by the Air Force Chief of Staff in April 1995 for use in trade studies of the Joint Air-to-Surface Standoff Missile (JASSM). This accreditation was based on Suppressor's use by both the Air Force and Navy in previous studies and on the availability of the Southwest Asian scenario previously developed under Joint Tac Air Electronic Warfare Study (JTAEWS).

There was also one significant Suppressor validation effort by the (now defunct) Command, Control, and Communications Countermeasures (C3CM) Joint Test Force (JTF) in 1987-9. This effort was conducted to support an assessment of the effectiveness of U.S. C3CM against a Soviet Combined Arms Army Air Defense System. The test was conducted in two phases: Phase I was a field test conducted on the Nellis AFB complex in conjunction with Green Flag 87-3, and Phase II was a Suppressor simulation of a European scenario. In order to establish the credibility of the Suppressor modeling in Phase II, the Green Flag exercise was also modeled in Suppressor and numerous comparisons between the exercise and model results were made to validate the model. Overall, the results between the model and Green Flag exercise agreed quite well.

In addition to the comparisons between field test and model results, several contributing validation activities were undertaken as part of the C3CM effort. One activity was simply a review of input databases for accuracy. A second activity consisted of sensitivity analyses in which small "vignettes" consisting of one-on-one or one-on-few engagements were modeled and examined to determine whether they produced expected results.

Documentation Assessment: Documentation assessment was outside the scope of the task order under which this document was prepared.

Software Quality Assessment: Software quality assessment was outside the scope of the task order under which this document was prepared.