

Extract from the IBM manual, "INTRODUCTION TO AN/FSQ-7 COMBAT DIRECTION CENTRAL AND AN/FSQ-8 COMBAT CONTROL CENTRAL," 1
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2.1 THE AIR DEFENSE PROBLEM

The problem of air defense is the protection of population, industrial areas, natural resources and retaliatory forces from hostile air attack. To accomplish this, it is necessary to determine what means are available or should be developed to provide maximum security under the greatest possible threat.

2.2 FORMER SYSTEM AND ITS LIMITATIONS

Formerly, the task of defending the United States against hostile air attack was performed by a manual ground environment system, and the functions of detection, evaluation, and interception were completely dependent on human operation. However, due to the increased speed capabilities of aircraft since World War II and the rapid progress in the field of missile development, the manual system of air defense was recognized as being completely inadequate to cope with such formidable means of attack. Recognizing the potentialities of these weapons during the early stages of their development, the authorities responsible for continental air defense saw the need for a rapid, accurate, automatic system of air defense.

2.3 DEVELOPING A NEW SYSTEM

The Air Force, in late 1950, enlisted the cooperation of various civilian organizations in its efforts to improve the capabilities of the United States air defense network. The overall program was known as the Continental Air Defense System (CADS) Project, under which civilian organizations helped to bring the national air defense system up to the best possible operating condition and made recommendations to ensure the system's continued effective operation. The air defense system was greatly improved by the CADS Project, but fell short of the Air Defense Command requirements for a vastly improved air defense system.

Simultaneously, studies were made on the combined use of digital computers and radar-data transmission equipment for application to air defense. The testing of a high-speed digital computer was recommended to the Air Force to provide information on the capabilities of such equipment to solve the ever-growing problem of air defense. The findings of this program led to many new concepts for solving the problem and resulted in the establishment of an experimental project which gave rise to the SAGE System. This project was developed in three major phases: the 1953 Cape Cod System, the 1954 Cape Cod System, and the experimental SAGE Subsector.

2.3.1 1953 Cape Cod System

The 1953 Cape Cod System was composed of a computer known as Whirlwind I (WWI) and a Direction Center, along with associated radar equipment. The purpose of this arrangement was to gather preliminary test data which would substantiate the concepts of the SAGE System then being planned. Emphasis was directed toward singling out obvious problem areas and attempting to correct whatever difficulties were encountered, rather than toward gathering complete statistical data on system operation. Consequently there was very little modification of equipment.

2.3.2 1954 Cape Cod System

The 1954 Cape Cod System was the same as the 1953 system except that radar network and mapping facilities were increased. Several minor improvements were incorporated in the operating positions within the Direction Center. The primary objective was to supply statistical results on system capacity and accuracy.

2.3.3 Experimental SAGE Subsector

The experimental SAGE Subsector, located in Lexington, Mass., was completed in 1955. It is equipped with a prototype AN/FSQ-7 Combat Direction Central known as XD-1. A radar system provides a variety of inputs similar in number and type to those used in the SAGE System. An Air Force ground-to-air data link is connected to the output for experiments with data-link equipped aircraft.

The experimental SAGE Subsector provides experimental data on electronic reliability, computer programs, and operating procedures. It is organized to support the regular functions of a Direction Center and is used to obtain operational approval and to determine required equipment modifications.