Two printers produce flight progress strips in blue or yellow for eastbound or westbound aircraft. Any deviation from a predicted performance can be inserted by the controller into the computer, which thereby inserts the new position information immediately printed. A permanent record is provided by the paper strip from the input printer, which also provides a means of visually checking the computer inputs. The film and its components showed how all the processes were performed at Schiphol. Copies are available in a number of languages.

Phase 2 of SATCO mainly provides for automatic conflict search and the display of progress strip information by electro-mechanical indicators instead of conventional printed paper strips. Radar inputs would also be possible, so that a aircraft could be identified and tracked and flight information updated continuously. Automatic tracking radars and air-ground data links could also be added to provide even more direct surveillance of flight paths and closure control. Some time after the introduction of Phase 2, conflict search and resolution would be achieved by conflict resolution, which would compute avoidance procedures.

A signal engineer foresaw the use of radar displays on which a computed position and identification of an aircraft would be displayed together with actual radar returns. The operator could then position a symbol over the actual aircraft echo, press a button and thereby insert a correction to the computer if necessary.

The audience very soon raised the question of reversion to manual operation in case of failure and the Signal engineer stated that a quarter of the elements in the present SATCO computer were intended for such failures and that calculations would remain in view after display failure so that the complete situation picture would remain and only the update function would be lost. The degree of redundancy to be achieved was a part of a system of this kind was, according to Signal, a difficult problem and one which was dictated mainly by economic considerations.

## RADAR IN AIR TRAFFIC CONTROL

The Guild's own paper, entitled The Application of Radar to Air Traffic Control, was prepared by a group of members and read by Sqn Ldr K. B. Crosbie, a member of the RA F United Kingdom Air Traffic Service. The paper considered the present situation over the United Kingdom under the three main headings of civil operations, military operations and the limitations of the radar system itself. Civil and military operations were carried out in accordance with different rules and with very different operational requirements. The civil operator wanted established radar information automatically from one controller to another. The controller would have to resolve a built-in collision hazard before he could perform his main task of controlling climb and descent.

British airways were two-directional meant that a radar controller as the main "thinking machine." Radar coverage was one thing, but utilizing it for aircraft control was different. The civil operator wanted to check and had no calculating function. Type 1 radar information need only be remoted to two of the combined air traffic centres. On this radar framework a system should be built up.

The conflict was not only civil/military, but also military/military. The latter problem could be overcome by centralizing control. Groups of adjacent airfields were in fact already being controlled as complexes. But a common controlling medium was required. The conflict was not only civil/military, but also military/military. The latter problem could be overcome by centralizing control. Groups of adjacent airfields were in fact already being controlled as complexes. But a common controlling medium was required. The civil and military systems were at present trying to achieve the same objectives.

Both types should satisfy a number of requirements. They could be matched against all other relevant information. Type 1 radar information need only be remoted to two of the combined air traffic centres. On this radar framework a system should be built up. Finally, the Guild stated that any automation or computers introduced into the control organization must leave the human controller as the main "thinking machine."

## THE SEVEN SINS OF INTERNATIONAL ATC

Speaking as he pointed out, in a private capacity, Captain Lincoln Lee of BOAC delivered an incisive and amusing indictment of seven "sins" which he had noticed during many years of operation on almost every BOAC route. The sins were pointed out against an air traffic control organization, bad timing, poor nomenclature, waste, poor discipline and mistakes. Captain Lee pointed out that he was not an ATC expert but a pilot and that despite the "seven sins" he had great respect for the work done by controllers. Neither were his remarks directed at any one country or any one place. The examples he gave of the seven sins were briefly summarized below.

**No 1 Sin: Poor organization and equipment.** All too often, point-to-point communication was non-existent or broke down, so that air-to-ground radio frequencies were at times choked with point-to-point messages. Sometimes the facilities were simply not used so that a centre was surprised at the arrival in its area of a particular aircraft. Captain Lee cited several instances of control against a computer which would reveal points for ATC communications and where radar information could be matched against all other relevant information. Type 1 radar information need only be remoted to two of the combined air traffic centres. On this radar framework a system compatible with present and future civil and military operations should be built up.

**No 2 Sin: Non-standardization.** In this category Lee put upper-air quadrantal levels not still generally agreed; metres