Concorde: The Costs Are Rising, but So Are Prospects for Success

Bristol, England. A TV film crew recently set up cameras in one of the plants here where the British Aircraft Corporation (BAC) carries out part of the Anglo-French Concorde supersonic transport project. Not long afterward, a BAC executive came running in response to a call from a foreman. A mini-skirted member of the TV troupe was clambering over the scaffolds surrounding a fuselage section, and, one by one, workmen were putting down their tools to saunter around for a look. "She'll have to stop that," the executive told the chief of the film crew. "We're on a tight schedule here." The girl was confined to ground level, and work was resumed. Crisis ended.

The next day it was rumored in Paris that the new French government had decided to drop the Concorde project for reasons of economy. Vast alarm ensued, until the government issued a formal denial.

The chronicle of crises, large and small, that stretches through the nearly 7-year-old Concorde project is book-length, and if even a small segment of them had been foreseen, it is possible the venture would have been written off as beyond attainment. But step by step, through political turmoil, repeated British attempts to get out of what proved to be an ironclad contract, ballooning costs, public opposition, and great technical difficulties, Concorde has proceeded. And now its makers—BAC in Britain and Sud Aviation in France—are expressing moderately plausible confidence that the controversial craft will turn out to be neither the financial nor the acoustical disaster that its opponents have long claimed it would be. As carping has increased in harmony with revelations that the development costs will be $1.7 billion—more than double the figure announced just a few years ago—the two manufacturers have responded with a joint *aide-mémoire* designed to "allay suspicions that there is some unrevealed and enormous skeleton in the Concorde cupboard. There is no skeleton," they state. "The problems ahead are obvious and self-evident technical ones. Of course there is risk—but that risk has been well defined and, hopefully, well contained." The *aide-mémoire* does not define "skeleton," nor does it take up the issue of social priorities in expenditure of public funds—which, when you get down to it, is what mainly motivates most of those who contend that the Concorde will be a fiasco in one way or another. What the manufacturers are arguing is simply that the Concorde will work satisfactorily and turn a profit, and fundamental to their confidence is the fact that two test models are actually flying these days and, by all accounts, performing well. Currently under production are two prototypes, and work has begun on three full-fledged commercial models that, under the current timetable, should go into regular service in May 1973.

Concorde 002 takes off from runway at Bristol for its maiden flight on 9 April.

Though no airline has committed itself to buy the Concorde until the testing is much further along, options for a total of 74 planes have been taken by 16 major airlines, including eight each by Pan American, BOAC, and Air France. The planes are expensive ($21.5 million is now stated to be the selling price, plus another $2.5 million for spare parts), and the options are cheap ($250,000 for one, less for bulk orders). But the indications are that the manufacturers are going to meet the specifications that they promised the airlines, which means that the Concorde will be able to carry approximately 110 passengers from London to New York in under 3½ hours, about half the time required by present-day jets.

Opponents say that Concorde is so overweight that it will have inadequate fuel reserves if immediate landing is delayed. But the manufacturers flatly deny that, though they acknowledge that the plane is far heavier than was specified in the original designs. If there are landing delays, it will still have fuel for another 2 hours of flight, according to BAC's Concorde sales manager, E. H. Burgess. And, Burgess says, since the public is admittedly in no mood to accept sonic boom, all schedule claims are based on the assumption that supersonic flight will not be permitted over populated areas. Instead, the Concorde will confine its 1400-mile-an-hour operations to overwater routes and land masses where the population is nearly nil. (For reasons unclear, no more than eight persons per square mile is the figure cited.) Unlike other Concorde enthusiasts, Burgess does not hold that the boom is no more noticeable than the rumble of a distant freight train. "It sounds like a fairly near crack of thunder, and we're assuming that people won't stand for it," he said.

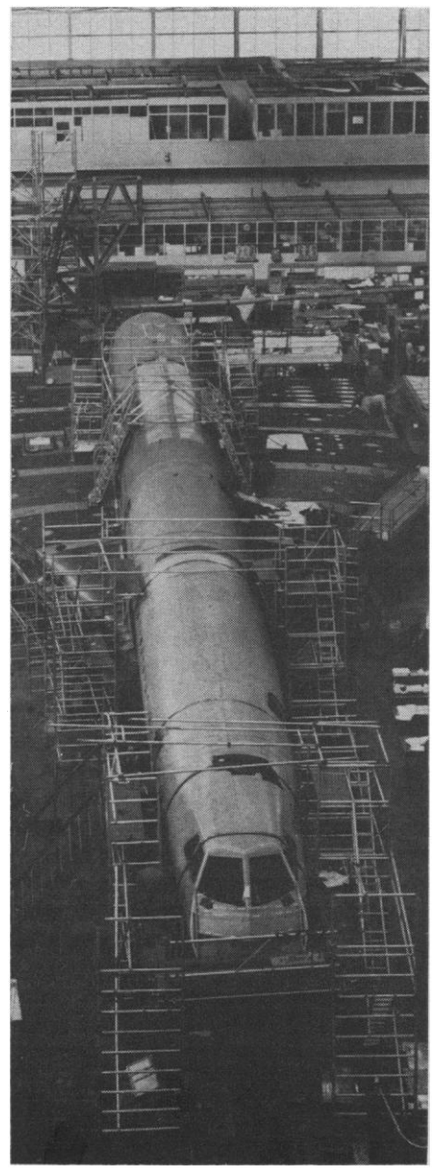
With the project at an advanced stage, thoughts have been turning to marketing strategy for the Concorde, and it is the well-heeled traveler in a hurry on whom the manufacturers and airlines are pinning their hopes. All market planning for the Concorde

takes place against the realization that, by the time the new plane goes into service, "jumbo" jets with vast passenger capacity—but no more speed than today's subsonic planes—will be in regular service with the same airlines that may be using Concorde. If Concorde fares are the same as jumbo fares, the reasoning goes, the Concorde will take business away from the slower planes. "Our proposal," Burgess said, "is that they should offer a one-class service, at a price higher than tourist fares, but about 15 percent lower than first class fares, though with first class seating and service." The Concordes are more expensive to operate—"25 to 35 percent more, depending on how clever you are," Burgess said—and the higher fares will help pay for them and also protect traffic for the lower-priced jumbos.

The manufacturers contend that 250 sales by 1980 will turn an ample profit for the project, and that that number of aircraft would in fact be handling no more than 10 percent of the long-haul passenger traffic now foreseen for the late 1970's. Just how much profit is not stated, but the *aide-mémoire* in defense of Concorde says that "it is an established fact that every airliner sold eventually brings in to its country of origin twice its original purchase price when spares, financing, etc., are taken into account." Will customers be chary of flying in the first supersonic transport? Perhaps so, and this is probably the reason test and demonstration programs far in excess of anything carried out on previous commercial planes are scheduled for Concorde. After some 3000 hours of flight tests have been completed, Concordes will be sent out for some 1500 hours of passengerless demonstration flights on commercial routes—the equivalent of about 400 transatlantic crossings.

Thus, BAC and Sud are either genuinely confident or doing a good job of whistling in the dark. Not quite so confident, however, is the British government, which, in a frequently tumultuous partnership with the French government, is paying half of the bills for Project Concorde—or, as it has been called when relations between the two countries have been particularly bad, "Project Discord." For the French, the prospect of a big lead in an important field of technology has, at least up till now, been adequate to soothe the pain of ever-rising costs. Concorde, on the present schedule, is 5 to 7 years ahead of the American SST project, and possibly a good deal more than that, since, in the United States, public opposition to the government's underwriting the development costs has greatly increased; further opposition is likely to flow from congressional disenchantment with the performance of many of the nation's big aerospace contractors.

As for the Russians, they have flown an SST similar to the Concorde, but Soviet aircraft are yet to achieve any significant number of sales with major airlines outside the Soviet bloc. Consequently, the French regard Concorde as a particularly grand and apparently successful response to the "American challenge" that so concerns them. The British, in fact, are just as challenged, but manage to be less concerned, and their official attitude toward Concorde, as expressed by the government in a recent parliamentary debate, is that, once Britain has lived up to the Anglo-French agreement to develop the plane, its future will depend solely on its commercial appeal. Behind this nonebullient attitude toward the most glamorous plane now flying is an extraordinary mixture of politics, economics, technology, and inadvertence.



Concorde prototype at Toulouse.

Concorde's genesis goes back to November 1962, when Prime Minister Harold Macmillan fixed upon the project in the belief that a big joint venture with the French would help ease Britain's way into the Common Market. Fearful that the French might change their minds after the project was under way, the British insisted on an agreement that barred unilateral withdrawal. Three months later, President de Gaulle held a press conference at which he paid tribute to the Concorde as a symbol of Anglo-French amity. He also said that France would invoke its right to veto British entry into the Market. Meanwhile, the project was getting under way on an organizational basis unprecedented in aviation, and possibly in any other major field of manufacture. Since each country wanted the benefits of cooperation, but did not want the other to get the jump on it in what might turn out to be a lucrative field, it was decided to build two complete assembly lines, in France at Toulouse and in Britain at Bristol. Each would turn out complete aircraft. There would, however, be no duplication in the production of parts. Instead, production would be about evenly divided between French and British manufacturers, with each supplying his product to both assembly lines. Rolls-Royce was selected to build the engines, and the French firm SNECMA received the contract for the exhaust assembly. At the time the agreement was signed, it was estimated that the development costs, to be shared equally by the two countries, would be under $500 million, but the British Minister of Aviation later told a parliamentary committee that the figure was "really rather arbitrary . . . not a great deal more than an inspired guess."

In October 1964, a bit short of a year after the agreement was signed, Macmillan's party was defeated, and its Labor successor, inheriting an economic crisis, indicated to the French that it would like to scrap Concorde. The decision was not motivated solely by the costs, which were beginning the

NEWS IN BRIEF

• **CLARK NAMED APA PRESIDENT**: Kenneth B. Clark, a noted Negro social psychologist and author of books on minority status and desegregation problems, has been chosen president-elect of the American Psychological Association (APA). Clark, who teaches at the City College of the City University of New York, will assume his post in the fall; he will become president in October 1970. Clark is a trustee of Howard University and recently resigned as a trustee of Antioch College in Ohio, after the college implemented a black-studies program he believed to be separatist in nature. The APA has about 28,500 members.

• **MARS SPACE MISSIONS**: The National Aeronautics and Space Administration is seeking scientists interested in conducting scientific investigations for future orbital missions and unmanned lander flights to Mars, scheduled for 1973. The investigations involve both direct measurements of the atmosphere and on the surface of the planet, and remote orbital measurements; the project includes the design and fabrication of scientific instruments, the observations, and the analysis of the results. Scientists interested in submitting proposals are invited to attend a preproposal briefing on 11 and 12 September in Washington. Further information may be obtained from Milton Mitz, Code SL, OSSA; NASA, Washington, D.C. 20546.

• **JOINT MIT-HARVARD HEALTH SCIENCES PROGRAM**: Harvard Medical School and MIT are designing projects for an extensive joint health sciences program, which will coordinate basic medical and biological research at Harvard with development in the physical, engineering, and management sciences at MIT. An 18-month design project, funded in part by a $650,000 grant from the Commonwealth Fund, is expected to involve more than 100 Harvard and MIT faculty members; it has been set up to fashion the new, joint institutional arrangement between the two universities and to plan programs and financing. Study groups will develop new courses in biomedical education at the M.D., Ph.D., and postdoctoral levels. They will design physical and engineering approaches to biomedical research, and will also study the application of modern management techniques and social sciences research to health care. Irving M. London, chairman of the Department of Medicine at Albert Einstein College of Medicine, will direct the design project. Design project results are expected to be implemented over a period of years, but one phase, collaboration in medical education, is expected to be implemented as early as the 1970-71 academic year.

• **LARSON NAMED AEC COMMISSIONER**: President Nixon has named nuclear industry executive Clarence E. Larson to a 5-year term as a member of the Atomic Energy Commission. Larson has been president and manager of the nuclear division of Union Carbide Corporation at the Oak Ridge National Laboratory in Oak Ridge, Tennessee, since 1961 and a member of its research division since 1955. Larson will receive $40,000 a year during his term, which will expire on 30 June 1974. He replaces Francesco Costagliola on the commission.

• **GOVERNMENT RESEARCH ON CONTRACEPTIVES**: A large number of contract programs for biological research in reproduction for the development of safer and more effective contraceptives has been approved by the National Institutes of Health after a long period of planning (see *Science*, 1 November 1968). Administered by the National Institute of Child Health and Human Development, 66 contracts totaling $3.3 million have been awarded to universities, nonprofit organizations, and pharmaceutical companies. Twenty-eight of these contracts are being financed by the Agency for International Development. The contracts will be used, specifically, to study processes of reproduction, possible methods of controlling fertility, the medical effects of existing contraceptives, and the development of new birth control methods. In addition, the NIH Center for Population Research, a government population research arm established in 1968, has let nine new contracts totaling $350,000 in the behavioral sciences to study family planning, population trends, and sociological factors influencing contraceptive development.

long climb above the original estimates. The new government was trying to negotiate a huge international loan to shore up Britain's economy, and the international bankers were demanding assurance that Britain would reduce expenditures as a step toward achieving solvency. Cancelling Concorde looked like a good way of both saving money and persuading the bankers that Britain was so serious about repairing its economy that it was willing to sacrifice this important venture. The British Attorney General was instructed to look after the legal details involved in getting out of the partnership. He reported back that the previous government—which had been worried that the French might drop out—had been so skillful in writing a binding contract that, if Britain dropped out without French acquiescence, the French stood a good chance of collecting about $250 million in penalties through the International Court. The French made it clear that they were determined to go on with Concorde. And so the project proceeded.

As it did, the government came upon a number of interesting discoveries. First it found that it was locked into paying for this expensive partnership without the Treasury ever having authorized any expenditures. And then it found that the contract with BAC and Rolls-Royce was on a "cost-plus and cost-to-be-agreed basis." But there was no way out. In 1966 the government acknowledged that the original cost estimates had been unrealistic; it was now expected that, rather than costing the two nations something under $500 million, the project would cost approximately $1.4 billion. The following year, the British pound was devalued, and this added another $60 million to Britain's share of the costs.

Meanwhile, there were a number of technical crises. The weight of the plane was so far in excess of expectations that, while it clearly could make it across the Atlantic, there were reports that it might have to do so without any passengers. The manufacturers denied this, pointing out that the history of aircraft innovation showed that planes always turned out to be heavier than had been anticipated, but that engines always turned out to be more powerful. Their credibility, however, was not especially high, and it went even lower when the costs continued to increase, the maiden flight—scheduled for February of this year—

was postponed, and BAC and Sud fell to scrapping over which side had fallen behind in supplying parts.

At that point, the British made an effort to get the French to agree on a cost ceiling for the project. A figure has reportedly been arrived at; the amount has not been announced, though it has been announced that the total cost is now foreseen at $1.7 billion. This inspired the *Economist* to charge that Europe is putting "its precious resources into a project that posterity may point to as the biggest technological boob of its generation."

In any case, the first plane off each of the assembly lines has been successfully flown, though it will be many months before supersonic speeds are attempted. BAC and Sud report that all is going well, but with Concorde's critics looking for new reasons to cancel the project, the two firms have announced, "It is the intention of the manufacturers to provide progress information, but they do not feel that this should degenerate into a list of transient headaches of the day. . . . There will be many . . . problems—all of them capable of being dramatised, and all of them, the manufacturers are confident, capable of being overcome by the normal engineering processes."

To show the public what it has been paying for, the two companies recently sent their Concordes roaring low over London and Paris—and it was indeed a spectacular sight. On this occasion, those who contend that pride and prestige must be calculated among the payoffs from national investment in advanced technology would have been heartened by an incident on a London street. A car-wash worker looked up as the Concorde, preceded by a flight of jet fighters, roared past. "At least it shows the British can do something right," he said.—D. S. GREENBERG

Narcotics and Drug Abuse: A Presidential Prescription

President Nixon last week asked Congress to counter the "serious national threat" of narcotics addiction and drug abuse with a ten-point program which includes a rewriting of existing narcotics and dangerous-drug legislation. The Administration proposals stress control measures and received a generally cool reception from those who are particularly concerned with narcotics and drug research and education and the rehabilitation of addicts.

The President's message to Congress called the proposals "initial countermoves against this growing national problem," so initiatives for research and education may be coming along later, but the Administration's first actions in the field follow a federal tradition of placing heavy emphasis on enforcement.

In one sense, the Administration is asking for an inevitable tidying up of an assortment of narcotics and drug laws enacted over the past half century. The new comprehensive law put forward by the Administration is a logical follow-up to the consolidation of narcotics and dangerous-drug enforcement authority in a single agency (*Science*, 13 December 1968), the Bureau of Narcotics and Dangerous Drugs, in the Justice Department.*

Work on an "omnibus" narcotics and drug law, in fact, was well under way during the last year of the Johnson Administration and rumblings of disapproval over the way things seemed to be going were audible from the community concerned with research and education in the field. General misgivings were expressed that the new omnibus bill being fashioned in the Justice Department would extend the traditional enforcement approach which has emphasized a rigid control of supplies of narcotics and resulted in serious difficulties for scientific investigators in obtaining and using drugs for research.

Concern was centered particularly on marihuana because the very rapidly increasing use of marihuana, especially by young people, comes at a time when there is relatively little scientific data on the effects of use of marihuana. Researchers contend that, because of federal laws which have classed marihuana with hard narcotics, research on marihuana has been seriously inhibited.

In his message, the President calls for a number of measures to help suppress international and domestic trafficking in drugs, proposes a model state drug law to complement revised federal legislation, asks the Attorney General and Secretary of Health, Education and Welfare to develop an improved education program on narcotics and dangerous drugs and promises training and aid to embattled local law-enforcement authorities.

The Administration's draft bill is primarily an effort to synthesize existing legislation, but there are significant changes. Some specific penalties are increased. For a first offender convicted of selling LSD, for example, the current 5-year sentence would be changed to a 5- to 20-year term. Instead of the present 1-year term for conviction on a charge of possession of LSD, the bill calls for 2 to 10 years.

The Attorney General also asked Congress to amend a law recently invalidated by the Supreme Court. The amendment is designed to meet the court's objections to what it termed self-incriminating features of federal laws which require persons handling narcotics and marihuana to be registered. The Court found a section of the Internal Revenue Code unconstitutional after considering an appeal on a case involving the conviction on a marihuana charge of hallucinogenic-drug champion Timothy Leary.

Questions about a potential violation of civil liberties have also been raised about the draft bill's provision of "no-knock" warrants which would permit agents to enter and search premises if, in the words of the statement from the Attorney General's office, "the official issuing the warrant is satisfied that there is probable cause to believe that the property sought may be quickly and easily destroyed or disposed of."

Probably the most important structural change embodied in the bill is

* Laws dealing with hard narcotics such as heroin and other opiates and marihuana were formerly enforced by the Bureau of Narcotics in the Treasury Department, and the Bureau of Drug Abuse Control in the Department of Health, Education, and Welfare handled enforcement of laws affecting psychotoxic drugs, such as the amphetamines and barbiturates, and most hallucinogenic drugs.