



by **David Diez**
Systems Analyst



and **Eleuterio Esteban**
Director, Spanish PRODAT office

*Advanced Systems Department
Directorate General of Civil Aviation
(Spain)*

PRODAT / PROSAT data links successful in controlling jet flight

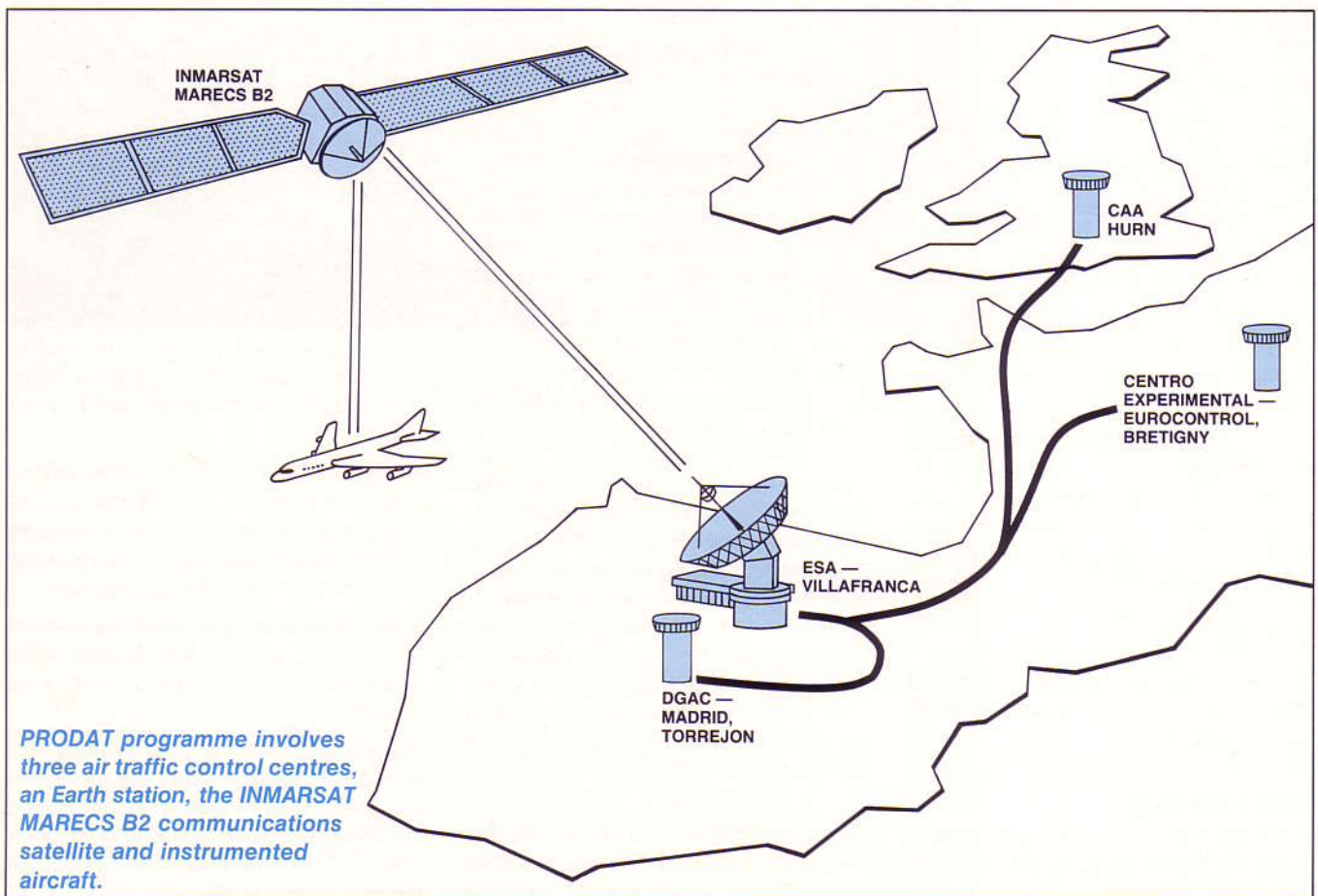
*In this multilateral effort last year,
evaluation flights were performed
using satellite-based data-link direction...*

SUCCESSFUL EVALUATION flights of a business jet aircraft have taken place under the PRODAT/PROSAT ATS experimenters project in which the European Space Agency, Spain, the United Kingdom and Eurocontrol participated.

On 24 October 1988, the Spanish civil aviation authority — the Directorate General of Civil Aviation (DGAC), using the automatic dependent surveillance and communications satellite-based data-link experimental system PRODAT/PROSAT, succeeded in controlling a Jetstream aeroplane owned by RACAL; it departed from Biggin Hill (United Kingdom) and after a technical stop in Nantes (France), landed at Madrid-Barajas Airport (Spain), becoming the first flight ever to be controlled by a civil ATC centre via a satellite-based data link.

Once the aircraft entered the Spanish Flight Information Region (FIR), all messages relating to en-route, descent and approach clearances, radar vectoring and weather information were given by Madrid ACC to the aircraft exclusively by means of the PRODAT/PROSAT satellite data link, until it was safely established at 4,000 feet (1,200 metres) on the localizer

(Continued on page 32.)



The following is a transcription of some of the more significant PRODAT messages interchanged during the recent trials, together with data from the automatic dependent surveillance function.

HOUR 14:16:33

MADRID THIS IS GRAVL READY TO TAXI AT BIGGIN HILL. OVER.

HOUR 14:16:46

COORDINATES	HEIGHT	TRACK ANGL	MACH N
E0000158 N511938	312	107.929	0.000

HOUR 17:45:47

GRAVL, MADRID ACC. TRANSPONDER ON 4662. OVER.

W0023238 N443926	16428	-166.816	0.344
------------------	-------	----------	-------

HOUR 17:48:41

MADRID THIS IS GRAVL. ROGER. SQUAWK 4662. LET US KNOW IF YOU ARE GOING TO REQUEST ANY SPECIAL MANOEUVRE.

HOUR 17:58:23

GRAVL, MADRID ACC. RADAR CONTACT 43 NM FROM BLO.

HOUR 18:09:56

MADRID, GRAVL. OVER. BLO FL170 ESTIMATING BGS 1825, REQUEST LEMD WEATHER. OVER.

HOUR 18:10:02

W0025433 N432050	16416	-155.917	0.344
------------------	-------	----------	-------

HOUR 18:13:20

GRAVL, MADRID ACC. WIND CALM. CAVOK. QNH = 1023. QFE RWY 33 = 954.3 TEMP 21. DEW 11.

HOUR 18:37:19

GRAVL, ROGER. MAKE A 360 TO YOUR RIGHT AND AFTER COMPLETING PROCEED TO SMA.

HOUR 18:37:40

W0033647 N415458	16452	-178.593	0.348
------------------	-------	----------	-------

HOUR 18:39:04

MADRID THIS IS GRAVL. ROGER. A 360 TO OUR RIGHT THEN TO SMA.

HOUR 18:39:40

W0033937 N414957	16428	53.265	0.346
------------------	-------	--------	-------

HOUR 18:42:41

W0033500 N414659	16440	179.296	0.350
------------------	-------	---------	-------

HOUR 18:42:51

MADRID, THIS IS GRAVL. COMPLETING 360, ESTIMATING SMA AT 1851 FL 170.

HOUR 18:59:57

MADRID, GRAVL. REQUESTING DESCEND CLEARANCE. OVER.

HOUR 19:02:01

GRAVL, MADRID. SQUAWK IDENT. DESCEND AND MAINTAIN 110.

HOUR 19:03:13

GRAVL, MADRID ACC. AFTER ACD PROCEED ON HEADING 180 INITIAL VECTOR TO LOCALIZER.

HOUR 19:04:43

W0034005 N402907	14964	176.308	0.404
------------------	-------	---------	-------

HOUR 19:04:56

MADRID, GRAVL. HED 180.

HOUR 19:07:53

GRAVL, TURN LEFT HEADING 130. DESCEND TO 5000 FEET. QNH 1023.

HOUR 19:09:34

MADRID, THIS IS GRAVL. HED 130 TO 5000.

HOUR 19:09:44

W0033120 N401139	9900	126.386	0.354
------------------	------	---------	-------

HOUR 19:10:56

GRAVL, HEADING 360. CLEARED IL5 RWY 33.

HOUR 19:14:24

GRAVL. CONTACT 119.9.



The Earth station employed for PRODAT is located at Villafranca del Castillo, near Madrid (Spain).

of runway 33 at Madrid-Barajas Airport. Voice communications were not used at all in any direction, even to confirm clearances, although the aircraft was at all times under radar contact.

Two air traffic controllers from Madrid ACC on board the aircraft helped with the exchange of ATS messages via the satellite data link. Also, automatic dependent surveillance messages were obtained from the moment the aircraft reported ready to taxi at Biggin Hill until it landed at Madrid-Barajas Airport.

Position reports were obtained automatically from the aircraft at a polling interval of approximately one minute. And, from the moment it entered the Spanish FIR, the positional data were displayed on a radar screen together with the corresponding map.

PRODAT, which is part of the European Space Agency PROSAT satellite project, includes experiments on ATS aeronautical applications in which our DGAC, the U.K. Civil Aviation Authority (CAA) and Eurocontrol take part. The objective of this collaborative effort is to implement part of the recommendations of the ICAO Future Air Navigation Systems (FANS) Committee in relation to automatic dependent surveillance and satellite data-link

communications. (Refer to the FANS/4 Report in the *ICAO Bulletin*; June 1988, pp. 10-15.)

The PRODAT instrumentation consists of four main sub-systems: in the aircraft, in the satellite, in the Earth station complex and at fixed user facilities. For the ATC trials, the fixed users are three experimental air traffic control centres — one each in Spain, France (Eurocontrol) and the U.K. Other fixed user terminals are in various company facilities for operational control, including telex terminals for public correspondence.

The focal point of the system is the Earth station, situated at Villafranca near Madrid. This includes both the radio equipment for satellite feeder links and the network management system (NMS), which serves as the intelligent interface between the satellite and terrestrial communication networks. The satellite used is the MARECS B2 of INMARSAT.

Eventually, nine aeronautical terminals will be fitted into aircraft, five produced by RACAL (U.K.)* and four by ISEL-PESA (Spain).

Also, a multi-aircraft terminal simulator, developed by ISEL-PESA-Madrid Tele-

* See also *ICAO Bulletin*, December 1988, pp. 15-19.

communications School, is being used to simulate a maximum of 40 aircraft.

With regard to automatic dependent surveillance, several test flights have taken place to evaluate various technical and operational parameters with the valuable participation of a BAC-111 belonging to an agency of the U.K. Government and an HS-748, operated by the CAA.

Commercial aircraft will also participate and, although most of them will not provide data, we expect that their collaboration will prove to be valuable.

The common objectives of the participants in the PRODAT ATS experiments are threefold:

- to test the ATC-relevant part of the PRODAT data link against the requirements to be fulfilled by any system providing automatic dependent surveillance and ATC communication facilities;
- to contribute to the study and definition of a homogeneous automatic air-ground communications data-link system, taking into account present and future ATC requirements; and
- to evaluate the possibilities of a suitable representation of the information delivered by an automatic dependent surveillance and ATC data communications system. □