EXCERPTS FROM 17 REPORTS ON A-O-5 (Arranged in chronological order)

Sven Grahn

Stockholm, Sweden

January 23, 1970

OSCAR 5 was picked up on 29.450 MHz at 1254.50-1300.30 GMT today, 83 minutes after launch which I understand took place at 1131 GMT. The signal here in Stockholm was rather strong but there was nothing on 2 meters which surprised me. TM frame rate is 53.0 secs (nominal is 52 secs I gather) and fade rate is 6 sec ±2 secs. TM channel 2 is indicating fairly quick movements. The two other orientation channels did not vary so much.

Shinichi Ito, JA7HYS

Koriyama-city, Japan

January 26, 1970

Congratulations, old mans. I'm copying A-O-5 signal every day on 144.05 MHz now. Today from 04:10:2 to 04:18:1 (GMT) I received the following data. But, my receiver is not well, so there are some errors.

Ch 1 ..... 1268 Hz (±3Hz)
Ch 3 ..... 605 Hz (±3Hz)
Ch 5 ..... 1226 Hz (±3Hz)
Ch 7 ..... 1260 Hz (±3Hz)

Bill Browning, G2AOX*

London, England

January 27, 1970

First of all very many thanks for your very fine phone calls re the launch and after, as it really put me in the picture that day, and all Europe as well. Rene answered the phone at the launch time, and could not come off her extension with the thrill of hearing the actual count down.

Will you thank Bill Scholtz for his NASA figures he kindly sent me, and also 73 to all the group for the excellent work you have all done on this project. We here have waited too long for this event.

Below is a list of European stations that have submitted accurate and useful reports to G2AOX up to 30th April, 1970.

DL1FL DL7KM DC8BO (Germany)
EA4DT EA4AO EA4KJ EA4KM (Spain)
F5BK F5YQ F8TD (France)

G2NH G2AOX G2AKQ G2BVN G3IGV G3WKG G3PWJ G3ZCZ G3ZEN
G6JF G6TS G8AXC BRS 15744 GM3GUI (England & Scotland)

HA8WH (Hungary)

HB9RO (Switzerland)

I1BMV I1SIR I1WCJ (Italy)

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*Ed. note: This is taken from a letter by Bill Browning, A-O-5 coordinator for Europe, to George Jacobs, W3ASK. Bill also sent his observations of telemetry data for the first 51 orbits, and a set of tables for predicting A-O-5 orbits.

LA8WF LA2AB (Norway)

LX1SI (Luxembourg)

OH2AYP OH3SE OH1SM (Finland)

OZ4EM OZ5WK (Denmark)

PAØFM PAØKJ NL-983 (Netherlands)

SM5ZY SM5CJF SM4HJ SM1DUW SM2CTY SL6ZK SM6ENG
SM7BJ SM7AED (Sweden)

SV1AB (Greece)

UR2BU (Estonia, S.S.R.)

ZE1AN (Rhodesia)

Also from The Universities of Kent, Essex and Bangor. Approximately 50% of the above have submitted good telemetry results, as the others did not have the necessary facilities.

The replies to date represent about 15% of the individual requests for report forms that were sent out.

John Goode Jr., W5CAY
Lake Jackson, Texas February 4, 1970

Enclosed is my first report on the A-O-5 experiment. In addition to the regular report form I have designed another form to allow rapid comparison of the rather large amount of data that I am getting. This form best shows the effect of stabilization as seen by the photometric sensors. It also shows some temperature oscillations that occurred in the skin temperature on the last few orbits.

I have also enclosed some strip chart recordings made from tape recording; these were run at 5 seconds/ inch to show complete resolution of the sensor data. I had planned to compare this data with cloud cover pictures from ITOS to determine sensor look angle, but the rapid stabilization of Oscar seems to have made this impossible. The strip chart recordings do show some internal electrical interference with the sensor data; this shows up as very regular "blips" on the otherwise smooth data (two groups of two peaks, with .625 second spacing between peaks in a group and 1.25 sec. spacing between the same element of adjacent groups).

Michael W. Ludkiewicz, W1DGJ
Ludlow, Massachusetts February 9, 1970

On Saturday, January 24th, I started monitoring the 29.450 MHz frequency before the equatorial crossing at 1901 GMT. I beamed my TA-33 in a south south-east direction. No signals were heard until A-O-5 passed my latitude at 1922 GMT. At this time I was beaming north and Oscar's position was over the Canadian Artic. Signals peaked at an S2 between 1934 and 1938 GMT. I lost the signals at 1945 GMT somewheres near Peking, China!

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On Sunday, January 25th, I again started monitoring the 29.450 MHz frequency before the equatorial crossing time of 1817 GMT. Again my beam was in a southerly direction. At 1831 GMT, when Oscar should have been close to my latitude, I swung my beam east and then northerly. I picked up the signals at 1836 GMT with my beam north and Oscar over Hudson Bay. Good reception was between 1838 and 1848 GMT with signals peaking at S3. I lost reception at 1903 GMT with Oscar over South Korea!

My receiver is a Collins 75S-1. Weak signals were copied with the BFO on but as the signals improved in strength I switched to AM reception. My antenna is a Mosley TA-33 exactly 60 feet above the ground.

I will be most interested if others experienced the same results. I realize that my beam did not help in reception of the satellite signals as it passed overhead but thought I should hear it as it came over the southern horizon.

Louis A. Stober, WA7GCS

Tigard, Oregon February 9, 1970

On orbit #152 for a 6 or 7 minute period after AOS of A-O-5, severe flutter was noted. This would be roughly from a point over the south end of Ellesmere Island to a point slightly above the Artic Circle over Alaska. From my QTH it would be from 10° true to 335°. It was quite obvious that some type of disturbance was in progress. A routine check with WWV, the evening before, indicated that a geo-magnetic storm and a proton event were in progress.

L. S. Kayser, VE3QB

Ottowa, Canada February 16, 1970

I was mainly interested in the time the satellite crossed my latitude. To assist me I wrote a short program in BASIC and predicted passes that were within my "window". If the satellite passed within this window I printed two minute values, lat., long., and X which tells me what portion of the loop the value is from.

The sample attached has limits for a typically lousy antenna and converter. It proved very effective as the signal was acquired 2-3 minutes early and left 2-3 minutes late. By varying the limits, the exact time of closest approach was computed for the polar loop, and several locals heard A-O-5 as it looped around the pole. The material given in the various QST articles was used. In the sample attached, the error, from the WIAW broadcast positions, was only 3 minutes, and about 3 degrees after 120 orbits.

Bernard H. Zweifel, HB9RO

Cheseaux, Switzerland

February 17, 1970

I have heard only very weak signals on Saturday (orbits 275, 276, 277, 278) and no more signals on Sunday (heard to orbits 288, 289, 290). My voltage measurements indicated some 18.4 V on orbit 102, and then around 17 volts on orbit 201; I cannot understand why the end came so fast, although the temperature and battery current were relatively high.

It was a wonderful experience for me, and I have learned one thing: for the next launch, I shall have a circularized polarity at the antenna, as well as azimuth and elevation controls. It's the only possibility to get sufficient SN/N ratios and low QSB, as well as accurate tracking.

John L. Hill, WØZWW

North St. Paul, Minnesota

February 27, 1970

First let me thank you for your part in providing one of the most interesting experiences of my 34 years of hamming. Attached you will find two sheets of observations conducted at my station during the first 432 orbits of the Australis-Oscar 5 package.

Most of my data, I am sure, will have value only when correlated with similar observations in a statistical analysis; however, since I was equipped for excellent reception of the package on 29.450 MHz at low vertical angles, my data on reception from extended distances may be of interest. I am particularly proud of my tape recording of reception of orbit #1 within 20 minutes of the turn-on of the 10 meter transmitter.

To summarize my observations, I would mention that:

1) There was a vast difference in signal character between daylight and dark passes.
2) An occasional dark pass was accompanied by weak signals, which I cannot explain.
3) There was a significant and consistent change in signals during daylight passes between those prior to orbit #400 and those after orbit #412, definitely correlated with the general 10 meter band conditions for signals traversing high latitude paths.
4) The effects of cross-polarization fading seemed to disappear when the signal was being received from extended distances.
5) A rapid periodic fade, too rapid to be explained by package attitude changes, accompanied many signals received from extended distances during approach from the south, but not during departure toward the north. (Extended distance reception was not observed during dark side passes.)
6) After considerable special effort, I was unable to find any correlation between reception of terrestrial stations and reception of the package from those same geographical locations.

Nick Marshall, W6OLO/2

NASTAR, Garden City, New York

March 1, 1970

NASTAR personnel have set up a complete satellite tracking facility at headquarters on campus at Nassau College in Garden City, L.I., N.Y. This was recently done to obtain precision data for the OSCAR-5 (AUSTRALIS-OSCAR) satellite launched January 23rd, 1970. Since OSCAR-5 signals were being transmitted on both the 2-meter and 10-meter amateur bands, complete receiving and recording equipment was obtained for both.

NASTAR began tracking OSCAR-5 on orbit #2, the day of launch (Jan. 23) and has at this writing (March 1) tracked and recorded over 200 passes out of a total of 470 orbits. This means that the tracking station was manned almost continuously at "normal" pass times from 1 a.m. to 5 a.m. and 1 p.m. to 5 p.m. daily!

Results obtained have been most rewarding and considerable new and unique information will emerge from this effort when all the data has been analyzed, classified and correlated. Once the OSCAR-5 satellite ceases to transmit, NASTAR plans to bounce 10-meter signals off the OSCAR-5 antenna to determine feasibility of passive tracking and perhaps passive reflected CW and/or SSB voice communication. NASTAR will also be tracking OSCAR-5 during the March 7th solar eclipse to obtain data on unusual propagation effects. In the data analysis area, we are also planning to use Hewlett-Packard's newest correlator to sift through some of our tapes in the search for additional data on anomalous propagation.

One of the most interesting things that was done since the 2-meter portion of OSCAR-5 ceased functioning, was to observe (and record) a 10 Hz frequency shift on the 10-meter carrier (caused, we think, by power-supply variations from the telemetry section of the package) thereby detecting the "spaces" between the HI identification sequence. In addition, much regular propagation data, antipodal reception, polarization data, signal flutter etc. is being analysed.*

W. P. Armstrong, WØPGP

St. Louis, Missouri

March 3, 1970

For orbit 199 the time for crossover into darkness was estimated ahead of time as 0906 to 0907 GMT by reference to a National Geographic Society globe. The analemma and equator circle were used to mark the terminator line at mid-pass. A-O-5 entered darkness when its surface track was 2455 statute miles distant on a line normal to the terminator. The sudden drop in the skin temperature began between 0908 and 0909Z, indicating an actual time of crossover probably about 1 to 1.5 minutes later than estimated.

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*Ed. note: See K.J. Doyle, "10-meter Anomalous Propagation with Australis-OSCAR 5," CQ, May 1970.

The temperature telemetry for orbit 199 showed the expected quicker response of the skin temperature and the later response, delayed 1.5 to 2 minutes, of the battery temperature. Presumably the skin temperature would cross below the battery temperature later in the dark period. Unfortunately the later parts of the dark periods were not observable from St. Louis.

Richard S. Long, WA4JID

Plantation, Florida — March 7, 1970

Orbit #542 - Solar Eclipse Pass, March 7, 1970

1819:55 - AOS - Signal normal (5-6)
1822:30 - Signal suddenly became very weak (4-1)-almost LOS.
1825:10 - Signal normal again (5-5)
1828:20 - Signal became weak and erratic sounding (4-3)
1829:40 - Sudden steady strength signal (5-6) with funny gravelly sound. Never heard signal sound this way before.
1830:00 - Signal became very erratic and fluctuated rapidly (very gravelly sounding); no pattern to these fluctuations. Sounded in some ways similar to orbit #468 on which I sent a special report, except that there was this very gravelly sound and there was no change in background noise.
1832:20 - Signal became stronger and took on a sound very much like RTTY signal.
1833:20 - Signal became weaker (5-3) and took on backscatter characteristics.
1834:40 - Signal became weak echo (4-1)
1835:10 - LOS
1841:10 - Heard signal again - weak echo (4-1) - beam 350°. LOS 1844:30.

(Ed. note: WA4JID also sent a report on orbit #468 when unusual disturbance was observed.)

F. Javier de la Fuente, EA1AB

Santander, Spain — April 6, 1970

I am sending you a report of the Australis Oscar 5 satellite signals received by me between February 18 and March 7 on the frequency of 29.450 MHz.

Every day I received perfectly well (599) the bulletin information sent by W1AW on 14.020 MHz.

(Ed note: This was accompanied by a table showing date, time, orbit number and RST value for 19 orbits.)

Bernard Pellaton, HB9WB

Cernier, Switzerland April 6, 1970

Here is information about telemetry that I mentioned in my last letter.

(Ed. note: This was accompanied by telemetry data for channels 1, 3, 5 and 7 from 29 orbits.)

Chuck Kunze, WØWVM

St. Paul, Minnesota April 26, 1970

The intended purpose of the Oscar 5 investigation at WØWVM was to measure polarization of signals arriving from the package, and to search out any anomalies occurring during close-in passes. This project was carried out using six specialized antennas. The lineup included (1) a standard horizontal dipole, (2) a vertical ground plane, (3) a linearly polarized broadside/endfire arrangement to provide time of crossing 45° north latitude, (4) a switchable east-west looker to provide either left or right hand circular polarization in either direction, (5) a zenith looker providing selectable circular polarization for signals arriving from overhead, and (6) an omnidirectional circularly polarized arrangement that provides a pattern complementary to the zenith looker. In other words, these last two antennas provide for receiving circularly polarized signals from any azimuth or elevation angle.

Oscar 5 daytime 10 meter signals arriving from great distance in either quadrant to the south, showed a polarization fade rate of one cycle or less per second. This roll rate showed up on the linear antennas, but not on the circularly polarized antennas. Signals arriving from intermediate distances (1000 to 2000 miles) also showed polarization fades on linear, but not on circular antennas. Signals from near zenith arrived showing neither a left nor a right hand sense of circular polarization. This means the signals arriving at the receiving antenna are linear. These measurements were made during daytime near zenith passes. The circular up-looker held overhead signals steady except for an occasional true fade when the tip of the antenna on board pointed its null at the receiving antenna. A linearly polarized antenna under the same circumstances showed polarization fades in the order of 10 seconds each.

So, in each case, the signals leave the satellite linearly polarized, pass through the ionosphere, and arrive at the earth antenna as rotating linear. Rotation rate data from northbound daylight passes generates a smooth curve (rate vs. distance) from a fraction of a second to a maximum of about 10 seconds at zenith. The night time rate follows a similar curve beginning nearly overhead with a rate of 20 seconds to a faster rate of about 3 seconds off to the south. During the northbound daylight passes, the periodicity gives way to random scintillations north of approximately geographic 50°. This condition also prevails during the first half of the night time south bounders. These effects are, of course, a result of proximity to the auroral zone.

Lee Blanton, WA8YBT

Cincinnati, Ohio April 29, 1970

1. Orbits 94, 107, 119, 182, 282, 482. Satellite was within line-of-sight range but no signals were heard.

2. Orbits 112, 192, 193, 279, 288, 292. "Sudden peaking" was observed, i.e. the signal, which was fading irregularly around S-3, say, suddenly jumped to S-5 or S-6 and then returned to S-3. Usually, a series of sudden peaks occurred in rather rapid succession, each peak lasting from about 1/4 to 1 second.

3. Orbit 113. Extremely long fades of about 30 to 40 seconds in duration were observed near the end of this pass.

4. Orbits 279, 292, 294, 369, 540, 280. "Dribbling" of the signal was observed, i.e. the signal sounded hollow, as if there was a trace of an echo on the signal.

5. Orbit 281. Signal strength dropped sharply and the signal began dribbling 3 1/2 minutes before LOS. Signal disappeared momentarily and then reappeared just before LOS.

6. Orbit 291. This pass was beyond line-of-sight range over the Atlantic.

7. Orbits 364, 539, 540, 541. These were polar passes beyond line-of-sight range.

8. Orbit 369. Signal was dribbling during the entire pass. The signal disappeared and reappeared three times before final LOS.

9. Orbits 380, 468. The signal reappeared after the satellite had passed beyond the pole. Two pairs of AOS/LOS times are shown. The first is for the original pass and the second is for the reappearance.

10. Orbit 542. This pass was during the total solar eclipse. No unusual effects were noticed.

R. Cordesses, F2DC

Beaumont, France May 8, 1970

A) During first days, spin rate was very fast. Signal fades were very deep and occurred approximately once per 30 seconds (orbit 27). Channels 2, 4, 6 gave quickly variable tones as sensors looked at earth or space. Then, it appeared that the stabilization system was working nicely, because, every day, the spin rate decreased. After the first week, tone changes on channels 2, 4, 6 were small (especially channel 1). At the same time, signal fades disappeared and during a long overhead pass (20 minutes) the 2 meter signal remained stable.

B) It was observed that current was higher than predicted by AMSAT publications: 80 mA with 10 meters ON, and 48 mA with 10 meters OFF.

C) Modulation of the 10 meter beacon was inaudible and I could not receive any telemetry signal on 10 m (only a carrier).

D) Voltage decreased more quickly than predicted and after the first week we could think that the beacon life will be short.

E) Internal and external temperatures remained stable during one pass, and from one to another pass. However, no measurements have been conducted during night.

F) On 2 meters, maximum signal level was approximately 30 dB above noise level. On 10 meters, it was only 18 to 20 dB above noise level (but the antenna gain was far lower on 10 m than on 2 m, and the 10 m antenna did not permit tracking in elevation).

Note 1: 10 meters signal was acquired earlier than 2 meters (1 or 2 minutes earlier) and disappeared after 2 meters: sometimes we could hear the 10 meter beacon a long time after 2 meter LOS. But, in this case, the HF signal was fading (sometimes lost during 1 or 2 minute and reacquired); the longest difference between 10 m and 2 m LOS was found to be 15 minutes (during orbit 103).

Note 2: 10 m signal during the first minutes after acquisition faded very rapidly (period 1 or 2 seconds). This effect was perhaps caused by diffraction on the horizon. This effect was not observed on 2 meters with the same strong fading.

Note 3: Doppler measurements have been made during some passes and gave results in accordance with theoretical calculations. On 2 meters: $\Delta f \approx 5.2$ kHz and on 10 meters: $\Delta f \approx 1$ kHz, for a near overhead pass.

Note 4: Antipodal reception tests gave good results on 10 meters. For example, during orbit 201, 10 m signal was lost at 12.43.25, then reacquired at 13.16.03 and lost again at 13.18.45. Signal strength was variable from very weak to very strong (the peaks were as strong as they were for an overhead pass).

On 2 meters attempts were made to receive antipodal signals, but nothing was observed. Perhaps this is due to low power, because on experiments with NIMBUS III antipodal reception was observed on 136.950 MHz. (Duration of antipodal reception on NIMBUS Automatic Picture Transmission signals was 5 minutes with fades to null.)
