SECRETS OF SUCCESS: LESSONS FROM WRTC-2006

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WRTC-2006 featured an exciting race between the top-scoring teams. A detailed study of their logs highlights many excellent operating tactics (and some occasional clinkers). Every contest has its great stories and moments of frustrations. The teams analyzed here share a few of those with us as well. Let's see what we can learn, and what can be applied to other contesting situations back home.

1 Antennas and locations

The WRTC hosts provided the following hardware at each operating site:Antennas on a 15 m tall tower:

- 20m, 15m and 10m: rotatable Acom LS86 8-element log periodic on a 6½ m boom.
- 40m: Two-element Yagi on a 6.7 m boom, on the same rotator.
- 40m and 80m: trap inverted vee.

- Feedlines and a manual coax switch for the three antennas.
- Acom 1010 amplifier.

This was the first WRTC at which competitors enjoyed a Yagi on 40m and transmitter power above 100 W. The Brazilian organizing committee felt that, at the bottom of the sunspot cycle from the southern hemisphere, reasonable signals required more power and better antennas than those used in past WRTCs. Events demonstrated the wisdom of the committee's judgment. Even with the additional power and gain the highest scores reached just over 2300 contacts, compared to 2700+ achieved in Finland during 2002.On Friday morning, July 7, each team's captain randomly picked a sealed envelope out of a pile. The envelope's contents included the site identification. Table A summarizes the characteristics of each site for the teams analyzed here. Five of the 46 WRTC teams, and two of the top eleven teams, found themselves in towns in the interior of the state of Santa Catarina; the remaining teams were relatively close to the Atlantic coast.

Dean Straw N6BV has begun examining the influence of local terrain on antenna patterns for some of the WRTC locations. While writing this article, not enough information was available to draw conclusions about sites versus performance.

team	site	locale	Operator/referee observations: Foreground to Europe	Foreground to North America
VE3EJ+VE7ZO	#5: north interior	Rural, elevated.	Slopes down, rolling.	Rolling
N6MJ+N2NL	#32: south Florianopolis	1 km west of sea.	Slopes down.	Flat with a few hills.
K1DG+N2NT	#23: central coast	NE side of hill	Steep down, sea 5km away	Land
UT4UZ+UT5UGR	#33: central coast	Suburban near sea	Flat to hills >10km away	Flat to low hills 10km away
IK2QEI+IK2JUB	#4: Florianopolis	Shrimp farm near sea	Very flat land.	Very flat land.
DL6FBL+DL2CC	#3: north coast	100 m to shore	Along coast, not over water.	Flat land.
9A8A+9A5K	#47: south coast	Lighthouse on peninsula	Ocean.	Small hill, lagoon, then hilly.
YT6A+YT6T	#17: central interior	Elevated; observatory.	Slopes down.	Slopes down.

Table A: Rough description of locations for the teams analyzed here. www.wrtc2006.com/site/mapa/maps.html contains maps identifying the numbered sites.

2 Contest rules and station hardware

Operating rules and scoring for the teams generally followed those of the IARU contest. Important variations included:No self-identification: Teams could not identify their operators, nationality, or use anything other than English language and common international abbreviations.

- A WRTC team, while constrained to one signal on the air at a time, could work on different bands immediately. The 10-minute rule for a normal IARU multi-single entry did not apply to WRTC competitors.
- Super check partial databases forbidden. The computers could only cite calls logged or copied during the contest, although operators could refer to printed lists of calls. A few teams brought a list of HQ multipliers expected to be participating in the contest.
- The operators could use two radios for listening, but only one radio and its current operator could make transmissions.

This last point greatly influenced the interconnection of competitor-provided radios and computers. A common solution included:

- Radio A: a transceiver with enough power to drive the Acom amplifier.
- Radio B: a second transceiver, used only as a receiver. Bandpass filters protected this receiver from the out-of-band transmitted signals of radio A and its amplifier.
- Two laptops, networked with an Ethernet or wireless LAN, for logging and spotting stations.

Some teams also had coax stub filters on their amplifier outputs and others wished they had! N6MJ+N2NL accidentally toasted the input 20m bandpass filter inside their radio B transceiver (a Yaesu FT-1000) and had to bypass it via the RX input jack. UT4UZ+UT5UGR also fried the radio B front end in the middle of the contest.

While the above description typified most setups, some teams had interesting variations. At least one team had no radio B, the second operator using instead a second independent receiver built into radio A (e.g., a Yaesu FT-9000).

At the other end of the scale, YT6A+YT6T used technology designed by Sinisa Hristov YT1NT. Radio B was a modified Drake R4C; external hardware determined the Drake's receive frequency and sent serial-port commands to force radio A's second VFO to track the Drake. At radio A, a special footswitch allowed the transmitting operator to immediately switch to the second VFO's frequency to work a contact spotted by the second op, without having to remove a hand from the keyboard. High-power filters on the amplifier output further reduced harmonic and IMD products that could disturb the second receiver. The computer-controlled filter system included an antenna multi-coupler that permitted radio B to receive with the log periodic while radio A was transmitting on that same antenna (700 W on a different band). The radio B position also included a bank of crystal filters on 40m to help the operator listen while radio A transmitted on 40m.

Advanced technological solutions are fun to try. In examining the hardware of the top finishers, one sees that technology may assist but does not determine the winners.

3 Overall results

Figure 1 plots the minute-by-minute scores of eight teams relative to the second-place finishers N6MJ+N2NL. Unlike past WRTCs, the leading team during the contest changed rarely. N6MJ+N2NL retained first place for almost 16 hours. Then VE3EJ+VE7ZO, having begun a long march back from fifth place, reached first at 0428Z and kept building their lead until sunrise at 1005Z, with more than enough margin to hang on for a commanding finish.N6MJ+N2NL finished second, with 95% of the Canadian score. No one else challenged these consistently excellent two teams. The third place team K1DG+N2NT finished much further back at 86% of the winning score. They held third for the last 12 hours of the contest.

At least six other teams held second or third place at some point in the contest. With less than one hour to go in the contest, less than 2% separated the scores of the six remaining teams analyzed in this article. Their order of finish would not be determined until the last 13 minutes of the contest! The Ukrainian team of UT4UZ+UT5UGR crept up to grab fourth, while the remainder finished tightly bunched at 80% of the first place score. ***Lesson:*** *Never give up! Only a few minutes of operating may change your final position in the contest.*

Let's bring our minds back to the morning of 2006 July 7, the Friday before the start of the contest in Brazil, and see what we can learn from these excellent teams. The random drawing of locations has just finished, and teams chat urgently with their assigned referee and host families…

4 Friday

By lunchtime many teams set off for their assigned locations around the state of Santa Catarina. Some will require more than three hours to reach their new weekend homes. Unfortunately, some teams reduce their contest performance before the contest begins.Several referees will report that, once on site, their team immediately focused on assembling their equipment in the operating room. These teams fail to prioritize their work or consider the relative consequences of potential problems. At least one team gets its equipment working properly only after sunset. They then discover some problem with an antenna developed during the weeks following initial installation and test. Repairs in darkness aren't feasible, and a handful of teams begin the contest handicapped by unresolved problems. Others didn't verify the rotator direction indicator, or check for interactions between the trapped inverted vee antenna and the 40m beam. ***Lesson:*** *At an unfamiliar location with limited remaining daylight hours, check and repair the antennas first!* One can install and, if necessary, fix radios and computers after sunset.

UT4UZ+UT5UGR have a different problem: the airlines will not deliver one missing bag of materials for their station until Monday after the contest! The radio B operator will not be able to listen on radio A's antenna while operator A is receiving.

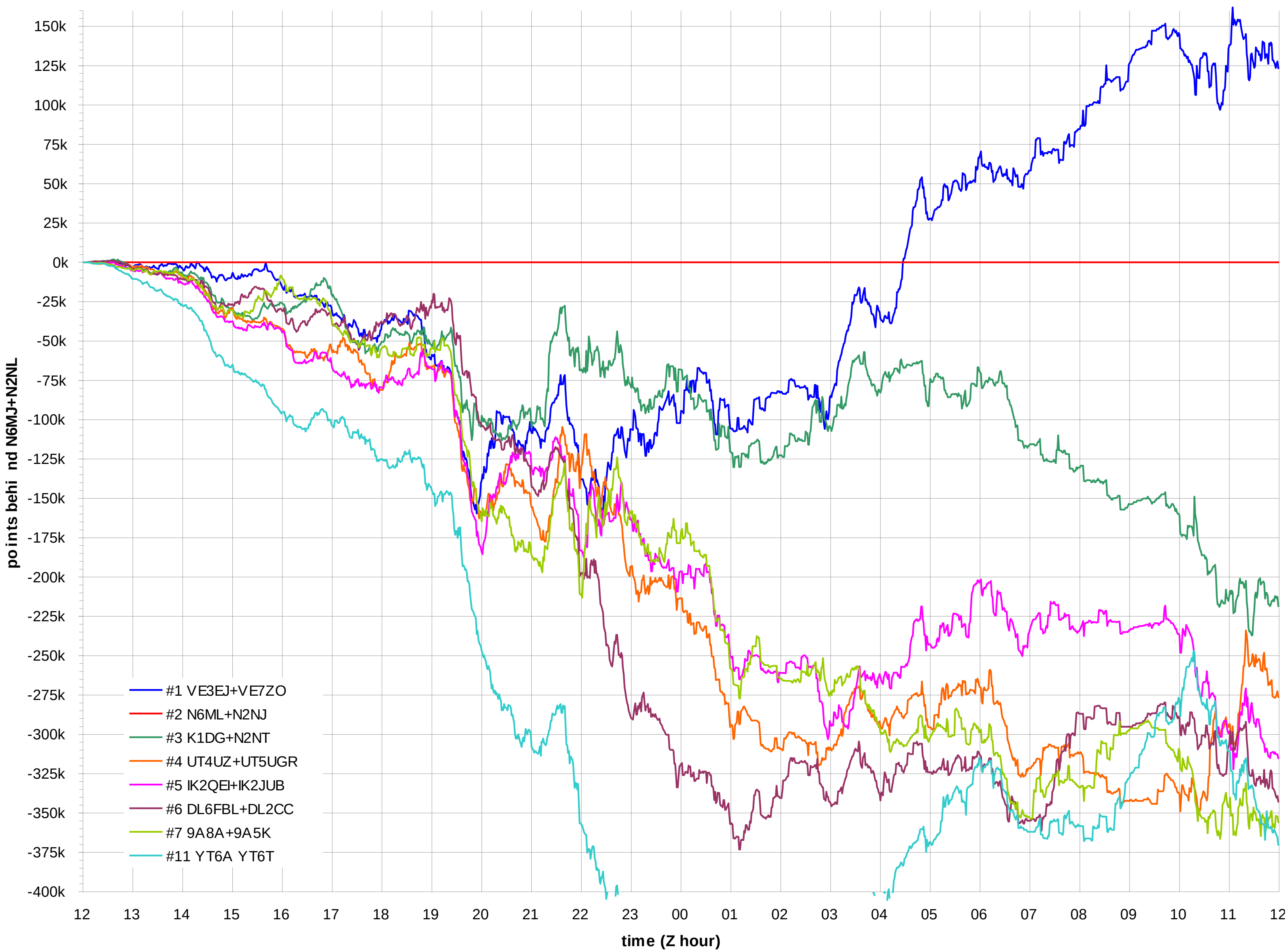

Figure 1: Minute-by-minute leading team scores, plotted relative to the second-place team N6MJ+N2NL.

5 The Start: 1200-1500z

Every contester who begins a serious contest effort at an unfamiliar location suffers through some nervous initial moments. Will propagation plans correspond with reality? Will the equipment work reliably? And, most of all, will this location and these antennas project a loud signal around the globe?

Imagine the terror felt by IK2QEI+IK2JUB when three minutes elapse before anyone answers their CQ! Stefan says, “When you start a contest like WRTC you always need a pileup from the first minute, not after 3 ‘day-long’ minutes! After that we did 130 QSOS in an hour: exciting and thrilling.”

DL6FBL+DL2CC grab first place five minutes into the contest, but can hang on only for twenty minutes before K1DG+N2NT take over. Doug and Andy’s reign at the top, equally short-lived, ends at 1248z. Now in first, N6MJ+N2NL together with the Canadians build a lead over the others, as shown in the 1500z standings of Table B.

The table shows DL6FBL+DL2CC with fewer raw QSOS than K1DG+N2NT and one less multiplier, but a higher score because of their richer percentage of 5-point DX QSOS. “Equivalent QSOS”, which take into consideration the point value of a contact and the value of new multipliers (see Annex I), quantify the ground that each team must cover to catch up to the one above it in the table. The middle of the pack, tightly bunched, trails N6MJ+N2NL by over 100 equivalent-QSOS, a gap destined to grow.

By the way, the charts, tables, and statistics cited throughout this article take into account contacts removed by the WRTC Log Checking and Judging Committee as duplicates, broken calls, broken exchanges, not-in-logs, or uniques (see Annex II), as well as associated penalties. Thus, when VE3EJ+VE7ZO log YO4SS at 1314z on 21032 kHz, the graphs show the team score going backwards because of the 5-point penalty for a busted callsign.

I have made one adjustment to the statistics released by the Log Checking Committee: I reversed the treatment of /MM and /M callsigns which were penalized at WRTC as broken calls. At that time the Log Checking Committee knew this treatment was wrong and due to a software error, but (after review) determined that it did not affect any results. In the worst case for the logs examined here, the misclassification of /MM and /M calls affected three QSOS.

	At 1500z:			E-Q’s behind			
Team	Points	QSOS	Mults	next team	20m	15m	10m
N6MJ+N2NL	**97,536**	358	**64**	—	15 / 15	303 / 29	40 / 20
VE3EJ+VE7ZO	90,944	**400**	49	-29.0	—	**375** / 33	25 / 16
DL6FBL+DL2CC	70,928	265	62	-77.8	21 / 16	213 / 23	31 / 23
K1DG+N2NT	68,733	290	63	-6.0	5 / 5	216 / 33	69 / **25**
UT4UZ+UT5UGR	68,332	360	44	-2.1	25 / 8	309 / 23	25 / 12
9A8A+9A5K	67,222	382	38	-6.3	**61** / 11	321 / 27	—
IK2QEI+IK2JUB	60,120	312	45	-36.9	—	296 / **35**	16 / 10
YT6A+YT6T	32,594	199	43	-168.1	37 / **17**	85 / 9	**77** / 17

Table B: Standings at 1500z, and QSOS and multipliers worked from the start of the contest. Band totals on the right show raw contacts / multipliers. In each column bold highlights the largest entry for these teams. Note: UT4UZ+UT5UGR also logged one contact with the Brazil HQ station on 40m at 1407z. See Annex I for an explanation of the equivalent-QSO (E-Q) measurement used in the center column.

5.1 Logging errors

Table C summarizes performance statistics for these teams with all adjustments. The top six teams demonstrate high accuracy compared to the contesting population as a whole. Busted call,

Team	Raw Q's with dupes	Dupes QSO	Dupes %	Claimed QSOS	Unique calls QSOS	Unique calls %	Q's after dupes & uniques	Busted calls QSOS	Busted calls %	Exchange errors QSOS	Exchange errors %	Not in log QSOS	Not in log %	bust, xchng NIL	Final QSOS
VE3EJ+VE7ZO	2491	53	2.1%	2438	13	0.5%	2425	32	1.3%	15	0.6%	7	0.3%	2.2%	2371
N6MJ+N2NL	2303	44	1.9%	2259	10	0.4%	2249	33	1.5%	7	0.3%	6	0.3%	2.0%	2202
K1DG+N2NT	2255	52	2.3%	2203	12	0.5%	2191	21	1.0%	33	1.5%	11	0.5%	3.0%	2126
UT4UZ+UT5UGR	2438	51	2.1%	2387	14	0.6%	2373	28	1.2%	15	0.6%	25	1.1%	2.9%	2305
IK2QEI+IK2JUB	2135	44	2.1%	2091	17	0.8%	2074	23	1.1%	7	0.3%	16	0.8%	2.2%	2028
DL6FBL+DL2CC	2011	26	1.3%	1985	76	3.8%	1909	19	1.0%	6	0.3%	9	0.5%	1.8%	1875
9A8A+9A5K	2165	10	0.5%	2155	67	3.1%	2088	39	1.9%	23	1.1%	7	0.3%	3.3%	2019
YT6A+YT6T	2411	41	1.7%	2370	240	10.1%	2130	40	1.9%	47	2.2%	13	0.6%	4.7%	2030

Team	Multipliers claimed	Multipliers final	Lost or unrecognized	Claimed place	Claimed score	Points lost	Score reduce	Time lost	Final score	Final place	Pass OK	Points / QSO
VE3EJ+VE7ZO	231	230	-1	#1	2,572,878	-128,438	-5.0%	0:43	2,444,440	#1	2	4.48
N6MJ+N2NL	244	241	-3	#2	2,460,984	-139,913	-5.7%	0:40	2,321,071	#2	7	4.37
K1DG+N2NT	237	230	-8 [a]	#4	2,277,333	-174,673	-7.7%	0:54	2,102,660	#3	5 [a]	4.30
UT4UZ+UT5UGR	209	206	-4	#5	2,203,344	-158,588	-7.2%	0:46	2,044,756	#4	—	4.31
IK2QEI+IK2JUB	236	233	-5	#8	2,117,934	-112,037	-5.3%	0:46	2,005,897	#5	5	4.25
DL6FBL+DL2CC	240	240	None!	#7	2,143,920	-165,600	-7.7%	1:01	1,978,320	#6	8	4.40
9A8A+9A5K	226	223	-4	#6	2,187,906	-222,607	-10.2%	1:10	1,965,299	#7	—	4.49
YT6A+YT6T	230	224	-10	#3	2,410,286	-457,230	-19.0%	4:32	1,953,056	#8	3	4.29

[a] K1DG+N2NT passed two HQ stations for an attempted five extra multipliers, but busted the exchange on these plus the original contacts that were the source of the pass. These errors significantly reduced the total of successful passes.

Table C: Performance statistics. The Log Checking Committee penalizes busted calls and not-in-log contacts by a point value equal to that claimed for the mis-logged QSO. "Unrecognized multipliers" are those the operators overlook because the station's zone or HQ code was busted. The affected team will not work these multipliers again later in the contest, nor those marked here as lost because of broken call, unique call or not-in-log. "Time lost" represents hours and minutes used at the end of the contest to replace mislogged contacts and disallowed uniqes.

mis-copied exchanges, and not-in-log errors do not alter the relative finishing positions of the top three teams.

Unlike the past two WRTCs, passing of stations and multipliers between modes and bands plays a tiny role in strategy. Here I define a pass as an error-free contact with the same station, on a different band or mode, within 5 minutes of the previous contact with that station. Table C shows the two USA teams, N6MJ+N2NL and K1DG+N2NT, pass more stations than other teams: 8 and 7. Multipliers count just once per band (not band-mode) this time and propagation limits the number of bands open at any one time; therefore, not many passes are needed or feasible.

At 1739z K1DG+N2NT pass P4ØHQ from 15m to 10m and then 20m for extra multipliers. Each time they log the exchange as "ARRC" rather than the correct "AARC". Not only do they lose credit for the contacts, they lose the multipliers. Ouch! ***Lesson:*** *When passing a multiplier, check log entries even more carefully than normal.*

5.2 Tactics on 10m

9A8A+9A5K work no one on 10m during these hours, for some reason not apparent in the log.

Some referees report tactical errors on 10m by other teams. Those teams' radio B operators would listen to another WRTC competitor calling CQ on 10m and react as follows:

- If the competitor's CQs go unanswered, the radio B operator assumes 10m is closed and moves to a different band.
- If stations that the radio B operator could not copy answer the competitor's CQs, the radio B operator concludes that his site was inferior to the competitor's site.
- The team's radio A operator would switch to 10m, make a few short CQs, and upon hearing no answers would switch to another band.

The first two tactics fail to recognize the potentially short-lived and spotty nature of 10m openings at this point of the sunspot cycle. A competitor may hear no replies to his CQ during the 15–30 seconds when you are listening – but that does not mean your own CQ will go unanswered. Marginal propagation means short-lived variations in the ionosphere will at times enhance signals to a certain area, and a few minutes later defocus signals or shift the focus to another area. Similarly, you may not hear stations answering a competitor's CQs, but if you were to transmit your own CQ, stations from a slightly different area would answer you. ***Lesson:*** *You must call CQ to determine if a marginal band is open for you.*[1]

Under marginal or rapidly changing conditions, the band may open or close temporarily, and re-open multiple times. A couple of minutes of unanswered CQs indicate the band isn't suitable for running at the moment – but the situation may change dramatically in ten or fifteen minutes. Some teams failed to check 10m regularly, and missed many hours of available propagation. ***Lesson:*** *If a marginal band appears closed now, check again in 10–15 minutes.*

The third tactic fails to recognize the dynamic nature of a marginal opening. Some WRTC teams send extremely short and fast CQ messages; e.g., "TEST P_5_" at 30+ WPM. This transmission takes two seconds, and the operator then listens for about three seconds for an answer. Five or six attempts occupied only 30 seconds, during which the station was transmitting for just 10 seconds. If the band opens fleetingly to a few areas within a distant continent at any given instant, what are the chances that someone out there in one of those currently open spots will happen to tune by the correct frequency at the correct time to catch that

[1] An IARU contest at the bottom of the previous sunspot cycle provided a memorable illustration. As a single op entrant at an average station in Maryland, 10m provided no contacts between North America and Europe during the day. During the following night's slow pre-dawn hours, I decided to call CQ on 10m for a few minutes. 15m wasn't yet open, but I knew unusual propagation modes were sometimes available on 10 and European contesters were likely enjoying local late morning conditions on higher bands, possibly including 10m. Spotlight propagation wandering through eastern and central Europe allowed a string of valuable multipliers to fall into my log while Maryland was still in darkness. My log was the only one showing European contacts on 10m from the northeastern USA that year.

CQ? ***Lesson:*** *Call CQ with transmissions long enough to be noticed by almost every station tuning up the band, typically longer than the time spent listening for a reply.*

Short, fast transmissions serve little purpose when no pileup exists. Slower CW speeds or longer transmissions increase the ratio of transmitting time vs. receiving time, allowing more opportunities for a search & pounce operator to find you. Since no pile-up is waiting, little harm occurs in taking a few extra seconds to send at a more relaxed and inviting pace. ***Lesson:*** *When replies dry up, try slowing down or sending longer CQ messages.*

When trying a new band, or new part of the band, don't rush to abandon the frequency. The pace of replies in any run varies widely from minute to minute. WRTC logs show the usual distribution of delays between the end of one contact and the start of the next. A 120 QSO/hour rate averages two contacts per minute, but over the course of an hour some minutes will have no contacts and others will have four or five. If an operator leaves a 120 rate on one band, he needs to call unanswered CQs for more than a minute on his new band. Only then can he fairly conclude that a 120 rate isn't achievable on the new band; i.e., he did not transmit those CQs during one of those short-lived dips in reply rates. With the adrenalin rush of fast rates, even 90 seconds of unanswered CQs often feels like forever! ***Lesson:*** *Allow unanswered CQs for at least 2–3 times the interval between contacts at the hoped-for rate, before abandoning a frequency as too unresponsive.*

Be aware that in slow periods this guideline may cause you to call CQ for five minutes without response; only then can you firmly conclude that a band won't support a 20- or 30-contact-per-hour rate.

Not only does this guideline assist in evaluating the productivity of a new band or frequency, it also allows time to for others to spot you on the DX spotting networks.

5.3 Meanwhile, back in the contest…

YT6A+YT6T start quite slowly. Uniques, discussed in Annex II, account for the loss of 28 contacts, beginning around 1410z. But uniques and errors do not entirely account for their lag. The unusual technology at YT6A+YT6T provides an interesting twist to their operating techniques:

Team	Run	Interleave	S&P
VE3EJ+VE7ZO	91.9%	0.4%	7.7%
N6MJ+N2NL	89.7%	2.1%	8.2%
K1DG+N2NT	81.2%	3.7%	**15.1%**
UT4UZ+UT5UGR	88.9%	1.6%	9.5%
IK2QEI+IK2JUB	84.4%	1.5%	14.1%
DL6FBL+DL2CC	89.3%	2.2%	8.5%
9A8A+9A5K	90.8%	0.6%	8.6%
YT6A+YT6T	86.2%	**8.1%**	5.7%

This table shows the percent of valid QSOs made by running, by interleaving spotted QSOs from another frequency in the middle of a run, and from traditional search & pounce. This analysis defines running contacts as those made on the same frequency, with interruptions of no more than two QSOs. Interleaved QSOs are those logged in mid-run. All other contacts (made on a variety of frequencies) go into the search & pounce category. The table lists teams according to their finish.Because their station hardware simplifies the task of interleaving spotted QSOs, YT6A+YT6T salt their runs with far more contacts from other bands than their competitors do.

K1DG+N2NT also show somewhat greater interleaving, but spend a lot of time in traditional search & pounce. In contrast, the top-place team almost never interleaves… and the second place team falls somewhere between.

Based on the current unhappy position of YT6A+YT6T, one might conclude that interleaving represents a losing tactic. That would be incorrect. During the first two hours of the contest, this team makes 46% of its contacts by search & pounce. Only recently has the team started running and interleaving contacts more seriously, and it pays off handsomely overnight.

Just before 1500Z, a man in the town of Armação heads out to his car with a bag of tools. He turns on the ignition of his ancient

Fiat and begins to tune up the engine. Next door, N6MJ+N2NL stare at their receivers: a S9+20dB noise covers the European signals on 10m! Their host, Mr. Hart, an electrician who is not an amateur radio operator, runs out of the house to speak with his neighbor. N6MJ+N2NL retreat to run louder signals on 15m, and a few minutes later the noise vanishes. Mr. Hart's neighbor will tune up his elderly Fiat tomorrow after the contest. And Mr. Hart will return to furtively checking the Internet hourly scoreboard of WRTC team standings, secretly rooting for his guests.

6 First band transition: 1500-2000z

You will recall VE3EJ+VE7ZO running about 29 equivalent-contacts behind N6MJ+N2NL back at lunchtime (1500z). By 1540z the Canadians chip the gap down to a single QSO... and thereafter follows a game of musical chairs between bands and leaders:1557z: N6MJ+N2NL (running on 15m CW) continue to widen their lead. Just at this moment, VE3EJ+VE7ZO (jogging on 15m SSB) work TMØHQ for the REF multiplier. While typing "REF" into CTWIN, the program crashes, locking up the computer. The machine requires a complete cold-start of Windows and CTWIN: seven minutes of eternity until logging the next QSO. Other teams, including K1DG+N2NT, discover this CTWIN bug on multiple occasions, triggering both cold starts and hot language. The bug gives 9A8A+9A5K (sprinting on 10m CW) a few extra minutes to overtake the Canadians for second place.

1617Z: The Croatia team (still on 10m CW) returns second place back to VE3EJ+VE7ZO (now on 15m CW). N6MJ+N2NL (now on 10m CW) continue to widen their lead.

1633z: K1DG+N2NT (having left 10m CW for 15m SSB an hour ago, and then moved to 15 CW at the top of the hour) grab second place from the Canadians (still on 15m CW). The Croatians (now running 10m CW) fall to third. N6MJ+N2NL (now on 10m CW after a five minute attempt to run 10m SSB) continue to widen their lead.

1650Z: K1DG+N2NT (still on 15m CW) reach their closest point to first: 29 QSOs behind N6MJ+N2NL (just giving up on 10m SSB and heading down to 15m CW). The Canadians (just giving up 15m CW for an attack on 15m SSB) have slipped to fourth behind the Croatians (still slogging away on 10m CW) but recover third in the next few minutes.

1703z: DL6FBL+DL2CC (hanging out on 15m SSB for the last two hours) overtakes the Croatians (still on 10m CW) for fourth. N6MJ+N2NL (now running 15m CW) continue to widen their lead.

1706z: K1ZZ, OH2MM, G3SXW and PY5CC visit K1DG+N2NT. Something about where they stand in the room alters the distribution of RF, causing an AC power strip to catch fire! Quickly extinguishing the fire, the team discovers that the relay enabling radios A and B to listen simultaneously to the same antenna no longer functions. Radio A can transmit but can not hear any signals. Thirteen minutes later the team bypasses the relay and gets back on the air; but radio B now must listen on a different antenna than that used by radio A. ***Lesson:*** *Unforeseen gremlins can undo complex equipment configurations at temporary stations. Make fallback and recovery plans in advance.*

1716z: VE3EJ+VE7ZO (who just moved to 10m SSB for a short-lived attempted run) regains second place from the temporarily off-air K1DG+N2NT. One minute later the Germans also pass K1DG+N2NT. N6MJ+N2NL (still running 15m CW) continue to widen their lead.

1725z: Three-way tie for third! The Canadians hold second (now running on 15m CW). N6MJ+N2NL (still running 15m CW) continue to widen their lead.

1745z: The Germans (finally leaving 15m CW for a 10m CW run) take second from the Canadians (back running 15m CW). The Croatians (running 15m CW a bit higher in the band than the Canadians) squeak by K1DG+N2NT (who have just finished a 15m SSB run and are running 10m CW). N6MJ+N2NL (now also running 10m CW) continue to widen their lead.

Got that? Phew!

Musical chairs continue at a slower pace thereafter, with VE3EJ+VE7ZO eventually falling briefly into fifth place at 1948z. The musical chairs episode carries an underlying, important theme. No, the theme is not "N6MJ+N2NL continue to widen their lead". WRTC runs are short-lived, and when a top-scoring team

team	Total 10m QSO/mult	First-last Q on 10m	QSOs/mults worked 1805-1922z 20m	15m	10m	total
UT4UZ+UT5UGR	182 / 25	1425 – 1805z	—	**235** / **10**	—	**235** / 10
K1DG+N2NT	178 / 33	**1242** – 1812z	8 / 8	150 / 4	14 / 0	172 / 12
IK2QEI+IK2JUB	177 / 32	1342 – 1821z	9 / 9	123 / 5	35 / 2	167 / 16
VE3EJ+VE7ZO	89 / 28	1332 – 1853z	—	116 / 2	53 / **4**	169 / 6
YT6A+YT6T	**246** / 31	1350 – 1858z	5 / 4	54 / 9	**75** / **4**	134 / 17
N6MJ+N2NL	135 / 30	1318 – 1915z	7 / 7	153 / 3	4 / 1	164 / 11
DL6FBL+DL2CC	139 / **36**	1339 – 1921z	**26** / **18**	88 / 3	7 / 2	121 / **23**
9A8A+9A5K	169 / 26	1514 – **1922**z	—	117 / 7	8 / 3	125 / 10

Table D: Team performance on 10m, in order of departure from that band. Columns on right summarize contacts made during the range of times for teams' final 10m QSO.

sees the rate begin to fade, they quickly change mode or band. Not only does this constant movement help the team pump up the rate meter, but also it helps the team catch any brief openings and associated multipliers on 10m.

In general, only SO2R, multi-op 2-transmitter or multi-transmitter teams can afford to park on a running frequency for hours on end (and even top competitors in these categories interleave QSOs from search & pounce). ***Lesson:*** *When the rate begins to fade, take immediate action.*

Afterward, YT6A+YT6T will report they wasted time during this period trying to interleave 10m multipliers while running on 15m. Like every other team, transmissions on a second band must bypass the manual-tune Acom amp. So for example, here this means transmissions on 10m used about 60 W, too low to crack these early pileups rapidly.

In late afternoon 10m starts closing. The teams analyzed here give up on the band at very different times, as shown in Table D. Examining the 10m subtotals for 1805-1922z reveals three teams

Team	At 2000z: Points	QSOs	Mults	E-Q's behind next team	QSO/mult worked during 1500–2000z 20m	15m	10m	total	E-Q/hr
N6MJ+N2NL	**590,250**	1058	125	—	108 / **28**	497 / 23	95 / 10	700 / 61	176.6
K1DG+N2NT	492,804	954	117	-188.6	47 / 25	508 / 21	110 / 8	665 / 54	164.2
DL6FBL+DL2CC	485,902	859	**127**	-12.2	**119** / 23	367 / 29	108 / 13	594 / **65**	146.7
VE3EJ+VE7ZO	451,794	1059	93	-79.9	10 / 10	**585** / 22	64 / 12	659 / 44	169.2
UT4UZ+UT5UGR	429,781	**1081**	89	-55.4	36 / 8	528 / 24	158 / 13	**722** / 45	**181.8**
9A8A+9A5K	425,568	1002	93	-9.9	1 / 1	479 / 26	**177** / **29**	657 / 56	168.7
IK2QEI+IK2JUB	406,014	937	98	-45.1	10 / 10	454 / 21	161 / 22	625 / 53	159.7
YT6A+YT6T	343,134	803	99	-147.2	21 / 12	414 / **30**	169 / 14	604 / 56	145.3

Table E: Standings at 2000z, and QSOs and multipliers worked between 1500z and 2000z. In each column bold highlights the largest entry.

made additional runs on 10m after others had given the band up for dead. DL6FBL+DL2CC, despite the second-lowest contact total on this band for the day (left column), logged the most multipliers.

UT4UZ+UT5UGR, with the second-highest contact total, log the fewest multipliers on the band. Although this team will finish the contest with an average amount of contacts interleaved by the second operator into the middle of a run, and works a lot of search & pounce, something about their operating technique gives them a disproportionately low multiplier total. This might result from their tendency to run one band for long periods, perhaps missing brief appearances by multipliers on other bands. Here we see this team first to quit 10m at 1805z, only to spend the next 1¾ hours solely on 15m.

At 2000z sunset darkens the eastern horizon. The Ukrainians have booked more contacts, but fewer multipliers, than the other seven teams; see Table E. K1DG+N2NT barely hold second place over DL6FBL+DL2CC with their excellent multiplier total. VE3EJ+VE7ZO milked 15m heavily and are in the middle of a string of 13 consecutive HQ multiplier QSOs on 20m that, in the next three minutes, will vault them temporarily into second place. But N6MJ+N2NL, with the second-highest multiplier and QSO totals of the afternoon, strike the right balance and stand far above everyone else. The arrival of the edge of night, however, marks the last time that I will write, “N6MJ+N2NL continue to widen their lead”.

7 Second band transition: 2000-2226z

Table F shows the order of departure from 15m. Unlike the 10m departures, teams that continue to check 15m pick up just a handful of additional contacts and multipliers. Only the German team makes a short run, ten European QSOs in six minutes at 2128z, demonstrating the band still has propagation long after other teams have given up its 100 QSOs/hour for something else.

Most teams stick largely to 20m after their departure, but check 40m for any early multipliers. UT4UZ+UT5UGR make the first serious swipe through 40m, which temporarily improves their weak multiplier total.

9A8A+9A5K, the team last to leave 10m at 1922z, abandons 15m first at 1958z.

K1DG+N2NT manage the overall transition quite well, gathering the largest number of contacts and multipliers during these first post-sunset hours. They sit comfortably in second (Table G) at 2226z.

	Total 15m		QSOs/mults worked 1959–2201z			
team	QSO/mult	Last Q on 15m	40m	20m	15m	total
9A8A+9A5K	811 / 53	1958z	1 / 1	289 / 30	—	290 / 31
IK2QEI+IK2JUB	750 / 56	2000z	—	293 / **40**	2 / 0	295 / 40
VE3EJ+VE7ZO	**961** / 56	2016z	—	**339** / 32	1 / 1	**340** / 33
K1DG+N2NT	730 / **60**	2049z	11 / 11	250 / 17	6 / 6	267 / 34
UT4UZ+UT5UGR	841 / 51	2049z	**63** / **23**	244 / 15	4 / 4	311 / **42**
N6MJ+N2NL	804 / 54	2125z	13 / 13	305 / 12	4 / 2	322 / 27
DL6FBL+DL2CC	594 / 56	2134z	—	280 / 12	14 / 4	294 / 16
YT6A+YT6T	522 / 47	2201z	10 / 10	178 / 16	**25** / **8**	213 / 34

Table F: Team performance on 15m, in order of departure from that band. Columns on right summarize contacts made during the range of times for teams' final 15m QSO.

	At 2226z:			E-Q's behind	QSO/mult worked during 2000–2226z				
Team	Points	QSOS	Mults	next team	40m	20m	15m	total	E-Q/hr
N6MJ+N2NL	**1,039,230**	1424	**162**	—	53 / 22	135 / 6	2 / 0	190 / 28	254.6
K1DG+N2NT	976,320	1363	160	-87.8	58 / 22	352 / 17	6 / 6	**412** / **45**	283.2
9A8A+9A5K	943,452	1400	146	-48.8	23 / 19	325 / **35**	—	348 / 54	297.2
UT4UZ+UT5UGR	895,855	**1443**	139	-76.7	**120** / **31**	242 / 15	4 / 4	366 / 50	**309.7**
IK2QEI+IK2JUB	880,383	1255	159	-22.1	24 / 21	294 / 40	—	318 / 61	278.2
VE3EJ+VE7ZO	878,772	1422	134	-2.6	10 / 10	**354** / 32	1 / 1	365 / 43	287.2
DL6FBL+DL2CC	816,504	1164	156	-88.8	10 / 10	284 / 15	14 / 4	308 / 29	193.7
YT6A+YT6T	652,125	1070	141	-269.7	15 / 15	229 / 19	**23** / **8**	267 / 42	208.9

Table G: Standings at 2226z, and QSOS and multipliers worked between 2000z and 2226z. The large number of new multipliers from virgin bands (40m and, for some stations, 20m) combines with fat runs to produce large equivalent-QSO rates. In each column bold highlights the largest entry.

VE3EJ+VE7ZO spend most of these hours in third. In the last fifteen minutes of the period they run a list of nine HQ multipliers on 40m CW, choosing to give up a hot 20m SSB run rather than interleave the multipliers into the run. They fall back into fifth place and will have to claw their way back up. However, as the last team to arrive on 40m, the virgin band holds great promise – if they can only find a run frequency among the chaos of contesters. On repeated occasions through the night they make three or four false starts on different frequencies, only to surrender each one to the QRM, with zero contacts to show for the time invested. Around the beer keg after the contest, no one reports an easy time here. Forty meters, she is the dominatrix of all bands: punishing, cruel, yet so rewarding!

Just as teams abandon 10m and 15m at widely different times, they make their first appearance on 40m in staggered groupings. YT6A+YT6T arrive first at 2049z. Three others pass through between 2115-2135z, with only UT4UZ+UT5UGR staying long enough to run 86 contacts. The remaining four teams appear shortly after 2202z but set right to work on a running frequency. 20m, now largely forgotten as the teams tear into fresh meat on 40m, will see only sporadic activity through the night.

Stefano IK2QEI explains: "I had to change several times my strategy because of low propagation… I tried to be early on 40m for working the European opening [2]… I wanted to come back after to 20m to work the USA opening during the night, but after 23z 20m closes."

The darkening sky drives some teams to 40m involuntarily. Street lights pop on all over the state of Santa Catarina. More than a few operators stab at their radio's noise blanker controls as noise levels rise. UT4UZ+UT5UGR, DL6FBL+DL2CC and N6MJ+N2NL will soon abandon 10 through 20m to the hash. In N6MJ+N2NL's case the buzz disappears later in the night, suggesting it radiates from nearby house lighting. As people go to bed, house lights go off, cleaning up the band a bit.

8 Third band transition: 2226-0100z

During these 2½ hours teams make their first moves on 80m. Unlike the other bands, 80m doesn't develop into a running band until much later in the night, and only a few of these teams manage to assemble significant runs. Not surprisingly the 80m QSOS made by early arrivals on 80m amounts to small beer; darkness

[2] In fact, the Italian team arrives on 40m with the last group. – K3NA

has not yet arrived to North America and intra-European QRM remains high over there.

Time of first 80m Q	Team	80m QSOs before 0008z
2254z	K1DG+N2NT first QSO	See below
2316z	N6MJ+N2NL	+11
2338z	K1DG+N2NT second+ QSO	+7
2341z	9A8A+9A5K	+9
2354z	YT6A+YT6T	+5
2356z	UT4UZ+UT5UGR	+6
2357z	IK2QEI+IK2JUB	+11
0000z	VE3EJ+VE7ZO	+5
0008z	DL6FBL+DL2CC	—

First to arrive, K1DG+N2NT make a local 80m contact at 2254Z but conclude the band is not open for DX yet; they returned 44 minutes later. Others start tasting the band during the 23z hour, with DL6FBL+DL2CC last to arrive at 0008z. Only N6MJ+N2NL stick with the band long enough to build a significant multiplier total by 0100z, perhaps sacrificing valuable time on 40m.Having stuffed their log with QSOs from the declining 20m band and being last to leave, 40m now represents new territory to VE3EJ+VE7ZO. This team rebounds up the ranks. At 0010z a quick detour to 80m adds enough multipliers to lift their score above K1DG+N2NT to regain second place. At this moment not only does the CTWIN HQ multiplier bug crash the Canadians' logging computers again, but also 80m turns out to be "hot": not with contacts but with RF in the shack. Stray pickup causes the computer to alter past data in the log! The Canadians flee back to 40m. John believes no QSOs were lost, but reduced transmitter power does not encourage attempts to run the band. After sunrise the next morning, they discover one leg of the 80m trap inverted vee touching the tower's top guy wire, very likely the cause of RFI back in the shack.

Table H also shows DL6FBL+DL2CC struggling, with a serious deficit on 40m. Having arrived on 40m at 2204z, rather later than most teams, the Germans discover a high, varying SWR on the 40m beam during transmission. After the end of a transmission, received signals briefly seem OK but then degrade many dB. The running operator returns to 20m for a bit; the other operator finds no obvious problem. The host climbs the tower to look for trouble and the team goes QRT at 2340z to allow for testing. The host discovers a hot-to-the-touch PL-259 connection between the feedline and antenna. No easy repair seems possible, so the station gets back on the air at 2356Z. 40m will prove a struggle for the remainder of the night. This, in combination with S-9 static crashes on 80m, portends a long, slow and frustrating night for

Team	At 0100z: Points	QSOs	Mults	E-Q's behind next team	QSO/mult worked during 2226–0100z 80m	40m	20m	total	E-QSOs
N6MJ+N2NL	**1,378,650**	1588	**195**	—	**24** / **16**	138 / 17	2 / 0	164 / 33	152.3
VE3EJ+VE7ZO	1,273,158	1602	174	-132.7	9 / 9	**168** / **28**	4 / 3	**180** / **40**	**193.4**
K1DG+N2NT	1,258,284	1527	188	-18.1	17 / 9	144 / 16	5 / **4**	166 / 29	133.3
9A8A+9A5K	1,227,222	1549	174	-39.2	10 / 8	140 / 21	—	150 / 29	139.6
IK2QEI+IK2JUB	1,128,195	1427	174	-125.3	19 / 8	151 / 16	4 / 0	174 / 24	122.1
UT4UZ+UT5UGR	1,084,845	**1608**	155	-64.3	12 / 1	151 / 15	3 / 1	166 / 18	112.9
DL6FBL+DL2CC	1,022,580	1277	180	-77.8	2 / 2	102 / 22	9 / 0	113 / 24	100.2
YT6A+YT6T	902,020	1243	170	-166.1	9 / 7	123 / 21	**45** / 2	177 / 30	137.5

Table H: Standings at 0100z, and QSOs and multipliers worked between 2226z and 0100z. In each column bold highlights the largest entry.

the team.

YT6A+YT6T finally touch their lowest point in the standings. Together with the Germans, their multiplier total stands well above what one would expect from their relatively low raw QSO numbers. With radios now on different antennas, they continue to mine the dregs of 20m in parallel with a good 40m run and start creeping up on the Germans.

UT4UZ+UT5UGR continue to fall behind on multipliers, now 40 multipliers behind the leaders. Their raw QSO totals in Table H remain higher than any other team, a few dozen ahead of the current first and second place teams, and at least 75 ahead of the rest of the gang.

By 0100z, on the strength of their multiplier totals, N6MJ+N2NL accrue a commanding lead in score. Although VE3EJ+VE7ZO stand in second place, 133 equivalent-QSOs separate them from the leaders. K1DG+N2NT continue to dog the Canadians, 18 equivalent-QSOs behind.

9 Stasis: 0100-0300z

Table I summarizes team performance during the next two hours, through which no changes occur in relative position. Each team generally focuses on 40m to Europe, with the occasional 80m QSO. Greg Cronin W1KM, with his four-square array in a Massachusetts salt marsh, claims the bottom spot on the band for his run frequency. He serves up the first 80m North American contact for six of these eight teams.

VE3EJ+VE7ZO makes just one detour to 80m for a little search & pounce, but the RFI in the station does not encourage them to linger. Compared to other teams in Table I VE3EJ+VE7ZO did poorly on 40m. Attempts to run low in the band typically lasted just five minutes. Big-signal contest stations in North America and Europe, pointed at each other, probably dominated this band segment, making a weaker signal off the side from Brazil less noticeable and less able to hold a frequency. Nonetheless, VE3EJ+VE7ZO creep closer to the leaders on the strength of their new multipliers.

K1DG+N2NT keep pace with the Canadians and also gain on the leading N6MJ+N2NL. These top three teams open an enormous lead over the rest of the pack. The fourth place 9A8A+9A5K falls to 219 equivalent-QSOs behind K1DG+N2NT.

Up on the northern coast, motors pumping salt water through their site's shrimp farm raise the noise floor on 80m to S9 at the Italian team's site. The team uses the radio's noise reduction controls to limit the damage and stay very close behind the fourth

	At 0300z:			E-Q's behind	QSO/mult worked during 0100-0300z				
Team	Points	QSOS	Mults	next team	80m	40m	20m	total	E-QSOS
N6MJ+N2NL	**1,518,230**	1680	**205**	—	**15** / 2	72 / 7	5 / 1	92 / 10	76.7
VE3EJ+VE7ZO	1,430,130	1677	190	-103.3	3 / 1	59 / 10	**13** / **5**	75 / 16	92.1
K1DG+N2NT	1,413,030	1621	201	-19.6	13 / 4	81 / 8	1 / 1	95 / 13	88.8
9A8A+9A5K	1,364,868	1624	186	-218.8	9 / **7**	66 / 5	—	75 / 12	81.9
IK2QEI+IK2JUB	1,224,692	1497	191	-25.1	10 / 2	47 / 16	7 / 0	64 / **18**	59.0
UT4UZ+UT5UGR	1,209,500	**1709**	164	-21.5	9 / 1	94 / 8	—	103 / 9	89.2
DL6FBL+DL2CC	1,117,452	1362	196	-112.2	8 / 2	77 / **13**	1 / 1	86 / 16	58.7
YT6A+YT6T	1,055,954	1378	181	-70.8	11 / 4	**120** / 6	4 / 1	**135** / 11	**100.5**

Table I: Standings at 0300z, and QSOS and multipliers worked during the preceding two hours. In each column bold highlights the largest entry.

place Croatians.

UT4UZ+UT5UGR and YT6A+YT6T shovel the largest numbers of contacts into their logs, but both teams log a disproportionately small number of new multipliers. Although UT4UZ+UT5UGR continue to maintain the overall lead in total QSOs, their very weak multiplier total keeps them far down in the standings.

10 Role of SSB

Overall SSB plays a much smaller role in this WRTC compared to past events, and will figure even less in the hours to come on the lower frequencies. Multipliers count just once per band here in Brazil, not per band-mode (as in 2002 in Finland). The standings depend solely on points scored in the contest with no special consideration for balance between modes (as was the case in 2000 in Slovenia). As a result, one properly switches to SSB for a strictly tactical reason: because the equivalent-QSO rate, right now, is momentarily better than on CW. At the end of the contest, the percentage of stations logged on SSB varies over a 2:1 range among these top teams:

Team	80m	40m	20m	15m	10m	All bands
VE3EJ+VE7ZO	—	13%	34%	44%	49%	31%
N6MJ+N2NL	1%	10%	17%	33%	8%	20%
K1DG+N2NT	—	9%	31%	41%	6%	25%
UT4UZ+UT5UGR	1%	7%	32%	36%	9%	23%
IK2QEI+IK2JUB	<1%	11%	39%	24%	27%	22%
DL6FBL+DL2CC	<1%	6%	26%	51%	13%	27%
9A8A+9A5K	—	17%	49%	58%	1%	40%
YT6A+YT6T	—	3%	59%	11%	15%	18%

Only DL6FBL+DL2CC will log more than one contact on 80m SSB. The emphasis (or lack thereof) on SSB appears uncorrelated with the final standings.

11 Winning Recovery: 0300-1000z

Local midnight brings a nearly full moon high overhead, setting the scene for two tremendous comebacks.

Minutes before 0300Z VE3EJ+VE7ZO tie for second with K1DG+N2NT, both teams trailing –6% behind the score of N6MJ+N2NL. Seven hours later, the Canadians stood 7% ahead of N6ML+N2NL, dramatically moving forward. What happened?

Table J lists the contacts and multipliers made by each team during this period. The reason for the change in ranking of VE3EJ+VE7ZO, together with YT6A+YT6T, becomes obvious: these teams work significantly more contacts than the rest of the com-

	At 1000z:			E-Q's behind	QSOs/mults worked during 0300-1000z				
Team	Points	QSOs	Mults	next team	80m	40m	20m	total	E-Q/hr
VE3EJ+VE7ZO	2,118,096	2184	216	—	53 / 10	**454** / 15	1 / 1	508 / 26	72.5
N6MJ+N2NL	1,973,340	1987	228	-145.8	49 / 11	258 / 12	—	307 / 23	41.3
K1DG+N2NT	1,812,456	1953	216	-173.4	81 / 8	245 / 6	6 / 1	332 / 15	45.4
IK2QEI+IK2JUB	1,736,217	1886	217	-82.8	113 / 12	264 / 13	14 / **13**	391 / 26	53.5
YT6A+YT6T	1,695,540	1880	211	-45.2	**131** / 15	369 / 14	1 / 1	502 / **29**	**74.4**
DL6FBL+DL2CC	1,683,584	1715	224	-12.2	73 / 15	280 / 13	—	353 / 28	49.9
9A8A+9A5K	1,663,038	1836	208	-22.7	41 / 8	263 / 13	3 / 2	307 / 22	43.2
UT4UZ+UT5UGR	1,635,270	2085	183	-35.4	53 / 9	324 / 10	—	377 / 18	53.7

Table J: Standings at 1000z, and QSOs and multipliers worked during the preceding seven hours. In each column bold highlights the largest entry.

petition… and N6MJ+N2NL simply comes up short. Only N6MJ+N2NL's large lead at 03z and the similar weak performance of the #3 team, prevented a collapse further in the standings. Why did these excellent operators perform so differently from others? Table K hints at some answers.

The top team in this list, YT6A+YT6T, spends far more time running than the other teams. They collect about a third of their 501 contacts from 80m runs. On 40m this team sticks to the middle of the CW band, spending 2½ hours at the start of the period on 7021 kHz and later returning for another 1¾ hour streak. During runs the operators interleave contacts with new multipliers and ordinary stations on other bands. These 44 interwoven contacts far exceed those of other teams. These operators find just two QSOs by search and pounce. All these contacts include a greater proportion of 5-point DX, which together with 29 new multipliers lifts them from far down the standings to fifth place. Soon, at 1018z, this team will briefly pass the Italians to become fourth. Over the past 11 hours this team has made a tremendous recovery, mastering their QSO-interleaving technology. They will finish the contest third in total contacts after deductions – an outstanding result since their heavy deductions for uniques and errors (representing 4½ hours of operating time at the end of the contest).

For the Canadians, 40m provides almost all of their 511 contacts. VE3EJ+VE7ZO runs 7016 kHz for about 1½ hours, but the majority of streaks show that a single frequency supports a run for just 5–10 minutes. Like the YT team, these operators avoid the bottom part of the 40m CW band. Unlike the YT team, the Canadians interleave just four contacts, switching to S&P for 54 QSOS and thus reducing their total run time. After getting burned with RF on 80m altering log data earlier in the evening, at 0555z VE3EJ+VE7ZO reduce power and eek out one short run on that band.

Two other teams, despite spending about the same amount of running time as the Canadians, do not score nearly as well. 9A8A+9A5K run mostly in the higher parts of the 40m CW and SSB bands and eschew interleaving any contacts. Around 0500Z static crashes begin annoying the operators. Within an hour the crashes reach S9+20 dB. Another two noisy hours elapse before the rain begins. Once the wind hits at 0813z, the 80m dipole stopped working. While 9A8A moves to run 40m, 9A5K tries not to think about the exposed lighthouse location – and dashes out into

Team	03-10Z E-Q/hr	Time (h:mm) spent running 80m	7000 -12½	7012½ –25	>7025	SSB <7100	SSB >7150	total	Change in rank	% S&P	% inter leave	% run
YT6A+YT6T	**74.4**	**1:43**	0:17	**4:11**	—	0:08	—	**6:19**	**>8 → 5**	0.4	**8.8**	90.8
VE3EJ+VE7ZO	72.5	0:17	0:08	2:27	0:57	**0:48**	—	4:37	2 → 1	10.6	0.8	88.6
UT4UZ+UT5UGR	53.7	0:29	0:08	0:23	2:41	0:02	0:03	3:46	6 → 8	14.0	3.2	82.8
IK2QEI+IK2JUB	53.5	1:22	0:13	2:14	—	0:04	0:05	3:58	5 → 4	15.4	1.3	83.3
K1DG+N2NT	45.4	0:14	1:18	0:37	0:46	—	0:07	3:02	3 → 3	**32.9**	5.4	61.7
DL6FBL+DL2CC	49.9	0:56	0:33	1:38	1:02	0:18	—	4:27	7 → 6	5.1	2.8	**92.1**
9A8A+9A5K	43.2	0:19	—	—	**3:23**	0:10	**0:38**	4:30	4 → 7	11.9	—	88.1
N6MJ+N2NL	41.3	—	**2:13**	1:05	—	0:16	0:08	3:42	1 → 2	15.0	2.3	83.7

Table K: Team running time and other metrics during 0300-1000z, ranked in order of average equivalent-QSO per hour rate. In each column bold highlights the largest entry.

lightning and pouring rain to repair the broken leg of the antenna. A few minutes later he rushes back outside again to fix a fresh break in the other leg. Twenty-five minutes later the team is back on a very noisy 80m, picking up two more needed multipliers.

This behavior illustrates Chris ZS6EZ's "Philosophy of Workload Management", as articulated back at WRTC-2002 in Finland. Chris explained that errors (e.g., logging calls or exchanges incorrectly, or overlooking a declining rate) increase as the operator's workload goes up. Poor technology (awkward logging software, complicated band/antenna changes) increases the operator workload. Equipment or antenna failures increase workload. Most operators first attempting SO2R find a horrible increase in logging errors while they go through a process of training, station debugging and workload simplification. ***Lesson:*** *Good technology reduces operator workload, which leads to improved performance.*

For Chris an aircraft pilot training exercise on simulators drove home this workload-management message in a second way. The simulator presented a two-person team (captain and copilot) with an escalating series of weather problems, engine failures, electrical faults, etc. In one team the more experienced pilot, the captain, took the controls and attempted to deal with the mounting crisis; they narrowly averted a (simulated) disaster. In a second team, the captain immediately asked his copilot to fly the aircraft. By reducing his workload, the captain had opportunity to sit back, review options, and determine the best course of action.

In the storm 9A8A+9A5K behave like the second captain and copilot. One operator immediately focuses solely on the task of flying the crippled station (keep filling the log with new contacts) while the other debugs and repairs the problems. Other good teams had thought about critical parts of their stations in advance, and developed contingency plans for potential problems in these areas.

DL6FBL+DL2CC spend half of their 40m running time in the bottom and upper parts of the 40m CW band. As the two teams from the USA demonstrate, the bottom of the 40m CW band produces relatively slower rates than the middle. Occasionally the S9 noise on 80m disappears for 15 minutes or so, and the team hops down to run some stations. Unfortunately these quiet periods did not occur early enough for the European opening on this band. On 40m the band quiets in time for many juicy Pacific multipliers to call in.

UT4UZ+UT5UGR spends less time running than the Germans, but spend it in the rich middle of the 40m CW band and interleave other contacts. The longest run lasts 1½ hours on 7039–40, yielding 196 stations after dupes and errors. Their rank improved by two positions as a result. Like the Canadians, RF in the shack causes some troubles. More significantly, radio B fails completely during the night. The team, with permission, substitutes an Elecraft K2.

In contrast N6MJ+N2NL never run longer than 47 minutes on a single frequency and did not run 80m at all. Dave N2NL will report: "Our station was good to Europe but only average to stateside... We simply weren't able to get anything going during this time on 40m or 80m, regardless of our location in the band. N6MJ was concerned during the S&P times that we should be CQing more, and I agreed, but our rate [was higher with S&P]. We truly struggled to work anything on 80m during this period, and as an afterthought, a higher SWR I noticed during this period may have been evidence that we had blown out one or both of the 80m loading coils since we were working stuff fine earlier in the evening."

K1DG+N2NT's log also shows many gaps between runs, and just one run spans 36 minutes; all other runs last 26 minutes or less. A plausible explanation may be the choice of frequencies low in the CW band. USA CW contesters with Extra class licenses and accustomed to keying domineering signals from the northeast states habitually crowd into the bottom of 40m for runs. That strategy works well from home (catching European operators as they first start to tune up the band). But in Brazil, sitting to the side of the North America-Europe path, with –3 dB lower power and lower antenna gain on 40m, a run frequency very low in the band seems statistically less productive. The competition for spectrum space from louder signals seems a plausible explanation. Later at night and after 40m closes to Europe, a low-in-the-band run frequency could experience less QRM, but still exclude replies from USA contesters with license limitations.

Some of the operating patterns just described correlate with the differences in performance. While correlation does not prove cause, plausible explanations exist for these correlations. Yet most of these patterns have exceptions: teams who deviate from the implied "productive operating practice".

- Teams which call CQ continuously, with only brief interruptions (a minute or less) to work a station spotted elsewhere, perform significantly better. During very slow periods (such as the 08z hour in this WRTC), low-productivity CQing often feels like the wrong thing to do. When teams only search & pounce, they fall behind. Exception: the Canadian team spends the 08Z hour searching & pouncing alternately on 40 and 80m, yet performs very well overall.
- Successful teams with faster runs spend more time running in the middle of the 40m CW band or even above 7025 kHz. Exceptions: Table K shows DL6FBL+DL2CC spend more time than the Italian team in these parts of the 40m cw band with inferior results. 9A8A+9A5K fare even worse despite 3½ hours running on 7034 and 7027. Note that the Germans suffer a problem with their 40m antennas, and thunderstorms with high static levels occur at the 9A site, probably bigger influences on results than choice of run frequency.
- Teams that spend significant run time below 7012.5 kHz on 40m CW experience shorter runs and poorer productivity. Exceptions: none!
- Split frequency 40m SSB run frequencies below 7100 kHz work better than calling CQ up above 7150 kHz. For example, VE3EJ+VE7ZO ran 32 minutes on 7070 kHz for 68 QSOs. As on other bands, SSB frequencies fizzle quickly, requiring operators to move often. Exception: none!
- Teams that interleave ordinary and new multiplier QSOs from other bands while running produce better results. Exceptions: VE3EJ+VE7ZO don't bother with much interleaving, and neither do IK2QEI+IK2JUB. One wonders how these teams would have fared if they had included this tactic.
- The VE and YT teams' locations may just work better on 40m for reasons that have nothing to do with the operators or the antennas. In the weeks following the WRTC more information about local geography will become available. Dean Straw N6BV will circulate some interesting antenna pattern comparisons with his HFTA tools. While location and technology do not guarantee good results, excellent operators in excellent locations become formidable competitors.

12 Final sprint: 1000-1200z

At 1000z N6MJ+N2NL lag a distant 146 equivalent-QSOs behind the Canadians. Unless lightning, power, or equipment failure took VE3EJ+VE7ZO off the air, the Canadians have locked up first place.

Similarly, N6MJ+N2NT lead K1DG+N2NT BY 174 equivalent-QSOs. Second place also seems locked up.

If the teams could see each other, K1DG+N2NT would need only to glance over their shoulder to see IK2QEI+IK2JUB 83 equivalent-QSOs behind, a rather narrower margin. YT6A+YT6T pursue the Italians with a gap of 47 equivalent-QSOs; DL6FBL+DL2CC follow closely, then 9A8A+9A5K and UT4UZ+UT5UGR at 143 equivalent-QSOs behind the Italian team.

The sun pops above the eastern horizon. Every team faces the decision of when to move to 20m. Their choices yield important insights into the proper handling of the abrupt transition from nighttime to daytime propagation at these low latitudes.

Table L summarizes how each team performed during the last four half-hour segments of the contest. The table lists teams in order of their final band change to 20m. 9A8A+9A5K leave 40m for good at 0957Z. They move too early, logging 14.9 equivalent-QSOs during the next half-hour, an inferior rate compared to teams still back on 40m. Unfortunately, they have just spent over an hour on 80m as that thunderstorm ended, working just one contact in the last 45 minutes. The slow rate on 20m probably felt exhilarating after all that static and dead time. It's not clear why this team didn't return to 40m around 0925z, when 80 dried

team	E-QSOS, mults, and run frequencies for 30 minutes beginning: 1000z	1030z	1100z	1130z	1000-1200z E-QSOS/mults	change in rank
9A8A+9A5K	14.9 / 4 **0957z**: 14025	43.5 / 5 14025 14203	61.2 / 5 14214	58.8 / 3 14214	178.4 / 17	#7 → #7
UT4UZ+UT5UGR	35.5 / 6 7026	60.9 / 7 **1030z**: 14026	69.1 / 9 14162	53.1 / 2 14026	218.6 / 24	#8 → #4
K1DG+N2NT	23.3 / 4 * 7000	29.6 / 2 **1035z**: 14009	56.7 / 4 14009	65.1 / 4 14226 14022	174.8 / 14	#3 → #3
DL6FBL+DL2CC	39.6 / 4 7007	27.9 / 5 **1042z**: 14001	49.2 / 4 14001	48.9 / 3 14002	165.5 / 16	#6 → #6
N6MJ+N2NL	55.4 / 3 7008	37.8 / 4 **1044z**: 14003	61.5 / 4 14002, 14243	70.0 / 2 14243 14004	224.7 / 13	#2 → #2
VE3EJ+VE7ZO	40.2 / 3 7016 * 7022	36.9 / 3 **1053z**: 14186	49.0 / 4 14186, 14221	56.5 / 3 14221	182.6 / 13	#1 → #1
YT6A+YT6T	41.2 / 3 7001	29.3 / 2 7024 **1059z**: 14251	44.3 / 4 14251	33.1 / 3 14251	147.9 / 14	#5 → #11
IK2QEUI+IK2JUB	11.8 / 5 (0943z) 14243 14019 7016	18.4 / 3 7016 **1059z**: 14234	63.4 / 6 14234	49.9 / 2 14234 14015	143.5 / 16	#4 → #5

Table L: Team performance and run frequencies during 1000–1200z. "" indicates the team checks 20m, making at least one QSO before returning to 40m. Bold highlights the time when the team makes its final switch to 20m. An equivalent QSO ("E-QSO") is one of average point value for the team; see Annex I for details.*

up. This tactical error drops them from #6 to #7 during the 09z hour. Their excellent 20m SSB run during the final hour allows them to hang on to seventh for the finish. ***Lesson:*** *When changing running bands, don't skip a band. Move to the next adjacent band for at least five minutes (long enough to get spotted) to get a feeling for the available rate.*

IK2QEI+IK2JUB make an even earlier attempt to run 20m, starting at 0943z, in accordance with their strategy to be on the highest open band during daylight. An unproductive SSB running attempt precedes a CW rate that exceeds even earlier efforts on 80m. This team does stop for five minutes on 40m on their way to 20, but only for search and pounce. As discussed earlier, search and pounce does not reliably indicate running productivity on a band. Their SSB run on 14243 dries up after 15 minutes, so they try CW on 14019 for perhaps five minutes and then revert to 40m. Tasting 20m SSB and CW run frequencies, finding the rates slow, and continuing on to run 40m CW on 7016 are reasonable decisions. Once settled on 40m at 1020z, however, the team doesn't pay attention to the decline in 40m rate 10 minutes later. It took a further ten minutes of declining rates (now 1030z) before the team switches to search and pounce – on 40m.

Stefano IK2QEI later explains their thinking: "During the morning we made a big mistake. We spent too much time to try with Japan on 40m but our signal was not strong (I think) and the pile up never started. We missed a lot." Eventually the team grabs a 20m run frequency at 1100z, and the equivalent-QSO rate jumps by a factor of six! The delay in returning to 20m costs this team one position in the final standings. ***Lesson:*** *If an anticipated band opening has not yet materialized to a productive level, and you revert to a back-up band, don't linger on the back-up band. At sunrise and sunset, and for a band expected to open only marginally (e.g., 10m at this time of the sunspot cycle), be absent for no more than 10–15 minutes.*

K1DG+N2NT ran 80m CW but checked 40m at 0940z. Rates on 40m are about the same as 80. After 15 minutes on 7034, the team tries running 14009 but makes just three contacts in five minutes. As the final two hours of the contest begin, a dry spell on 20m pushes them back to 40m (a few hundred Hz above 7000 kHz) exactly at 1000z for a better squirt… but rates fall off after 1015z. One operator interleaves S&P contacts from 20m, but the run operator doesn't move to 14009 until 1035z, whereupon a steady run materializes. Perhaps the team would experience a faster 20m run above 14025, where more USA contesters could call them. In any event, an earlier running attempt on 20m around 1020z, after the 40m rate starts declining, would likely produce more contacts for the log.

A good decision by the Ukrainians vaults them from eighth to fourth place during the last two hours. The Ukrainians have spent the 09z hour searching and pouncing 80 and 40m simultaneously, but strangely not calling CQ. Performance by this team perks up substantially at 1000z when one operator starts running 7006 kHz very effectively while the other pounces on occasional stations on 20m. (Perhaps fresh coffee has just arrived.) The team makes the final jump to 20m at 1030Z; a good run on 14026 forces the rate meter even higher. Rather poor in multipliers, the team gathers some additional multipliers on both bands. This, together with good timing and frequency choices, leads to a strong finish. Well done!

By a slight margin N6MJ+N2NL make the most of the last two hours. 7008 produces many JA and USA contacts during 1000–1030z but at 1025z the rate starts to fade. The second operator had picked up a 20m multiplier a few minutes before, and the team contemplates a band change. At 1030z the 40m rate fades rapidly, and the second op scores two more multipliers on 20 SSB. The team moves to 14003 at 1044z and the rate meter takes off. Shortly thereafter the frequency becomes unproductive and, after five minutes fighting QRM with only two contacts, the running op slides down 1 kHz. The rate triples. On the next rate meter fade the men jump to an SSB run frequency, returning back a half hour later to CW when SSB fades. Very well played, indeed. ***Lesson:*** *A sudden drop in rate suggests interference to your run frequency; check and take corrective action.*

VE3EJ+VE7ZO came off a ten minute S&P session on 80m (remember they use reduced power on this band to counteract RFI) at 0942Z to do further S&P on 40m. After five minutes 7016 was established as a running frequency and the rate meter inflated. The meter crests at 0955z as the final two hours begins and in the next 15 minutes declines to half of its peak value. Time to change bands? Five minutes on 14007 produces three contacts, so the running operator returns to 40m on a different frequency at 7022. Rich in JAS and far more productive than 20, this run's new multipliers and contacts pushed the equivalent-QSO rate above 330 at 1030z. Shortly thereafter the rate crashes. Although 20 minutes had elapsed since the end of the last visit to 20m, the run operator elects to move to 7002 instead of checking 20m again. Another string of JAS follows on 40m the operator misses the greater rates other teams enjoy on 20m during the remainder of the 10z hour. In no danger of losing first place, the team simply surrenders some of its lead to the second and third place finishers. However, in a tighter race (as seen at other WRTC events), this delay could have more serious consequences.

Every contest has great stories, and WRTC is no exception. Twelve minutes before the end of the contest Ben DL6FBL, running 20m CW at 14002 kHz, says to Frank DL2CC, "We're still missing zone 10 on this band." Frank replies, "Don't worry. XE1NW is always late." One minute later XE1NW calls in for the last multiplier of the contest.

That's it: contest over. The teams have ten minutes to get those logs into Cabrillo format and into the hands of the referee. Then we'll head back to Florianopolis. The referees will turn in the logs to the judging committee, and we'll all gather around the beer kegs to swap stories and lessons. One common story: the difficulty of sustaining any kind of run on SSB. I've heard that story at every WRTC so far this century!

13 Lessons learned

- Before the contest:
  - At an unfamiliar location with limited remaining daylight hours, check and repair the antennas first!
  - Unforeseen gremlins can undo complex equipment configurations. Make fallback and recovery plans in advance.
  - Good technology reduces operator workload, which leads to improved performance. Bad technology increases workload, which increases operator errors. Choose only good technology.
- Running:
  - If you are not running an existing pileup, call CQ with transmissions long enough to be noticed by almost every station tuning up the band, typically longer than the time spent listening for a reply.
  - When replies dry up, try slowing down or sending longer CQ messages.
  - Allow unanswered CQs for at least 2–3 times the interval between contacts at the hoped-for rate, before abandoning a frequency as too unresponsive.
  - When the rate fades, take immediate action.
  - A *sudden* drop in rate suggests interference to your run frequency; check and take immediate corrective action.
- Changing bands:
  - When changing running bands, don't skip a band. Move to the next adjacent band for at least five minutes to get a feeling for the available rate. This is especially important when propagation changes rapidly; e.g., at sunrise and sunset.
  - You must call CQ to determine if a marginal band, or one expected to open very soon, is now open for <u>you</u>.
  - If a marginal band, or one expected to open very soon, appears closed now, check again in 10–15 minutes.
  - If an anticipated band opening has not yet materialized to a productive level, and you revert to a back-up band, don't linger on the back-up band. Be absent for no more than 10–15 minutes.
- General:
  - Don't get fooled by simple rate meters. Measuring equivalent-QSOs per hour takes into account QSO point values and new multipliers.
  - Log very carefully. Contacts deleted and penalties triggered by logging errors equate to switching off the radio before the end of the contest.
  - When passing a multiplier, check log entries even more carefully.
  - Never give up! What you do in the next few minutes may improve your finishing position.
  - Every rule has its exceptions (including this one!). If you decide to break a rule, know why you are doing it. Watch closely for the impact of your decision, and switch strategies promptly if equivalent-rate declines.

14 Acknowledgments

Thanks to these people who were interviewed for this story, each of whom provided valuable insight to the events or reviewed the drafts: Chris Kovarik 9A5K, Frank Grossman DL2CC, Bernd Och DL6FBL, Roger Western G3SXW, Don Field G3XTT, Stefano Brioschi IK2QEI, Doug Grant K1DG, David Sumner K1ZZ, Ward Silver NØAX, Andy Blank N2NT, David Mueller N2NL, Phil Goetz N6ZZ, "Tree" Tyree N7TR, Atilano Oms PY5EG, Thomas Carlsson SMØCXU, Yuri Onipko UT4UZ, John Sluymer VE3EJ, and Ranko Boca YT6A.

I take responsibility for the opinions expressed here and for all errors. See you in the next contest!

Annex I Rate Meter Deception and Equivalent QSOs

"Should I stop what I'm doing now and do something else?" A good contester asks herself this question continuously. The winning contester changes operating tactics whenever the new tactic will improve the score faster than the old tactic. But how does one evaluate two different tactics?Many contesters watch their logging software's rate meter: that display of raw QSOs worked recently, expressed as QSOs per hour. If the rate meter goes up, they feel things are going well. When the rate meter heads down, eventually they make a change in tactics: change bands, change mode (for multi-mode contests), switch between running and search & pounce, change antennas or antenna system configurations, or change running frequencies.

Rate meters come in several flavors; last 10 minutes, last hour, last 10 QSOs, and last 100 QSOs are common versions. For brevity I will only state (but not prove here) that, in many contest situations, measuring the last 10- OR 100-QSOs to calculate rate often deceives the operator. Such measurements can tell the operator that his performance is falling off, when in fact it is improving – or vice versa.

Measuring the last 10 minutes or last hour to determine rate helps avoid one class of false indications. But even a last-10-minute measurement of raw QSO rate can mislead. Here is an example, taken from the VE3EJ+VE7ZO log.

During the ten minutes 2200–2209z, the team worked 11 QSOs on 20m SSB. Then, switching to 40m CW, in the next ten minutes they worked 12 contacts. Should they stay on 40m CW? The rate meter at 2210z read "66 QSO/hr" and now, at 2220z, it reads "72 QSO/hr". Some contesters would look at that information and conclude that one should continue with the current tactic.

Hold on, though! Those contacts on 20m SSB were almost all 5-point DX. If we had a "QSO points per hour" rate meter, back on 20m SSB at 2210z it would have read "348 QSO points/hr"... and now at 2220z on 40m CW it reads "114 QSO points/hr". Guess that switch to 40m was a big mistake! Sure, VE3EJ+VE7ZO worked an additional QSO in the last 10 minutes, but all their QSOs are of low-point value. And that simple last-10-minute QSO-per-hour rate meter: throw it away!

But wait! There's more to the story. Back on 20m SSB, VE3EJ+VE7ZO worked one new multiplier. Here on 40m CW, they just worked nine new multipliers. So *now* which operating tactic was best? Help!

What we need is a performance parameter that takes into account the number of contacts, their point value, and the value of new multipliers. Ideally, it should resemble a rate meter, since contesters are familiar with that general concept.

In this article's analysis, I use "equivalent QSOs per hour". An "equivalent QSO", or E-QSO, expresses performance in terms of how many average QSOs would be required to achieve a particular improvement in score.

Let's go back and look at VE3EJ+VE7ZO's score at three recent times:

Time	QSOs	QSO points	Multipliers	Score
2200z	1393	6455	124	800,420
2210z	1405	6513	125	814,125
2220z	1416	6532	134	875,288

During the first ten minute period, the score increased 13,705 points. At 2200z, an average QSO was worth (800,420 / 1393) = 574.6 points to the then-current score. If, over the next ten minutes, the team just worked QSOs of average QSO point value and no multipliers, it would require (13,705 / 574.6) = 23.9 average contacts to reach that score shown at 2210z. We can state that those 12 specific logged contacts (worth 58 points and one new multiplier) *are exactly equivalent to* 23.9 QSOs of average value. I'll call them "equivalent QSOs". Since these occurred over a ten minute period, multiply 23.9 by six to convert to an hourly equivalent-QSO rate of 143.1 for the 20m SSB run. Applying the same calculations to the next ten minute period, we find the score increase of 61,043 (resulting from 11 contacts worth 19 QSO points and 9 new multipliers) equates to 105.6 E-QSOs. The hourly E-QSO rate on 40m CW just hit 633.3!

Looks like those new multipliers were really worth something. We better tell John and Jim to stick with their current tactics.

A few minutes later, 40m dries up and they go back to 20m, on cw this time. At 2230z the 380.4 e-qso/hour rate isn't as good as all those multipliers back on 40, but it's much better than the earlier rate on ssb. Being smart guys with a good feel for this stuff, they continue to hop around quickly during this slower part of the contest, changing tactics when the e-qso rate drops off for more than a few minutes.

One cautionary note: the very first venture on a new band, with its high proportion of new multipliers, will drive e-qso/hr numbers to very high levels. That often is the correct tactic (e.g., start populating the log with multipliers from 160m); but sometimes that's just a distraction. Abandoning a good afternoon run on 15m just to grab the first ordinary stations that show up with weak signals on a virgin 40m band could be counter-productive in the long run.

Equivalent qso per hour is superior to ordinary rate meters for tracking tactical performance trends during the contest. Think of a long contest as a series of short, 10-minute contests – 144 of them for a 24-hour contest like iaru or rdxc. Select an operating tactic that represents the very best thing you can do for your score in the next ten minutes. As you work through those next minutes, use the e-qso/hr figure to decide if your current operating tactic is, in fact, superior to what you were doing ten minutes ago. If not, make a change.

Annex II Uniques

Within a few hours of the end of the contest, the WRTC Log Checking Committee received over 1,300 logs arriving from around the world. The committee included this material, along with logs from WRTC competitors in Brazil, in its master database.

Initial trial discrepancy reports for the 46 WRTC teams revealed unusually high numbers of "unique" QSOs in four logs. A unique QSO is one with a station that appears in very few of the other >1,300 logs; it is not literally unique (i.e., occurring just once) and the appropriate threshold for labeling a QSO as unique may vary from one contest to another. Table C includes the unique percentage for all eight WRTC teams analyzed here; the other teams' percentages are included in their UBN reports, posted on the WRTC-2006 website.

Three of the four teams whose logs contained a disproportionate number of uniques had their logs analyzed in this article. (SP7GIQ+SP2FAX were the fourth team affected.) For two, DL6FBL+DL2CC and 9A8A+9A5K, the unique callsigns came almost entirely from their respective home country. (The percent of non-home country unique calls fit into the very low levels typical of other WRTC logs.) The first unique German calls appeared in the German log at 1443z, in the middle of a 15m CW run; the team had made 27 SSB contacts (none with German stations) before this time. For 9A8A+9A5K, the first Croatian uniques appeared at 1509z during a 15m SSB run.

The YT6A+YT6T log contained over 200 unique contacts with calls from many countries, nearly all of them in Europe. The first appeared just 54 minutes after the start of the contest, before any SSB contacts occurred. Only nine unique calls from YT appear in the log, and these occur very late in the contest after a 1024z spot on the Balkan DX Yahoo forum identified the operators.

Referees had recorded operations at DL6FBL+DL2CC and at YT6A+YT6T. In the time available, the judges, team referee G3XTT and I listened to parts of the YT6A+YT6T recording. We confirmed that contacts with the callsigns had occurred. However, it appeared to us that a very small number of stations, probably more than one, fed the unique contacts to the team.

So how did this many stations come to work just one of these four teams, sometimes on several bands and modes, but none of the other 1,300+ stations participating in the IARU contest?

No evidence exists than any of the affected teams communicated their identity to outsiders (a violation of the WRTC rules). Nor does any evidence exist that the affected teams colluded in an effort to "dope" their log with phantom calls and contacts not available to other contesters. Experienced contesters know adjudication uncovers unusual patterns such as uniques, so an effort to dope the log will come to the attention of the judges.

In the opinion of the judges, the phantom QSOs more likely represented an attempt to sabotage either specific teams or a randomly selected team. Such behavior by amateur operators outside of WRTC is reprehensible, violates the radio regulations, and deserves thorough investigation. Time available at WRTC did not allow completion of such an investigation.

A large quantity of contacts made available to one WRTC team, but not to any others, violates the spirit of the WRTC. (WRTC attempts to provide an equal playing field for all teams.) The judges turned to the problem of how to deal appropriately with the situation within the context of WRTC.

The committee decided to set a relatively small threshold of log appearances for the purpose of categorizing a contact's callsign as unique, and to delete from all 46 WRTC logs, without penalty, all unique QSOs.

This approach resulted in the deletion of, at one extreme, just three contacts from a WRTC log containing over 1,900 contacts to, at the other extreme, the deletion of 240 contacts from the YT6A+YT6T log of over 2,300. Most WRTC logs lost about 15 contacts.

No doubt a few contacts so treated were valid contacts; others represented busted calls where insufficient evidence prevented labeling them as busted. The deletion of a very few valid contacts that fell into the same pot as the uniques did not alter the relative positions of any teams whose logs carried typical unique percentages.

Within the top three claimed wrtc scores, yt6a+yt6t moved from third to eleventh. Part of their change in position resulted from logging errors affecting multipliers, and a higher error rate in busted callsigns and exchanges.

The material in this Annex largely comes from the report of the wrtc Judging Committee to the organizers. The wrtc-2006 website contains the full, original report.

— END —