BY RICHARD HUMPHREY

NO PLACE TO GO, BUT UP

THE PROUD HERITAGE OF AMATEUR RADIO SUFFERS FROM LETHARGY

"HERE WE ARE in 1969," a ham friend of mine said the other day, "and incentive licensing is a fact of life. AM is out the window and you can't find DX on 20 nohow—what are we going to *do* about it?"

I hadn't witnessed so much confusion since the time Fred Brown sold his Reo and used the money to build an amateur radio station—the first in our neighborhood. Everyone was glad to see the Reo go because, when Fred opened that cutout, it was something! The ham station was lots quieter though some people were sure we'd all get struck by lightning what with all those wires around.

To us kids, though, the thought that good old Fred had a radio station right in his own basement was stupefying.

"He talks to a guy in England. I heard him!" Eyes would grow big and round and the whole gang would creep around to Fred's cellar window and crouch still-voiced as the mysterious crackles and squeals of short-wave radio came to our ears.

I was quite a bit older before I got to know Fred *real* well—before he and I would sit in his basement and talk about the early days of radio.

"Looky here," he'd say, waving a yellowing copy of *Electrician & Mechanic* or maybe *McClure's*. "This fellow Branly was real put out when Marconi patented the coherer. It was a tube," Fred would explain, "full of metal filings with a connector at each end and Marconi made it self-restoring." He'd turn a dusty page. "Branly claimed *he'd* invented it. Only thing was, a man named Hughes invented it before *him*. In 1878, says here."

Called charlatan and opportunist by many contemporaries, Irish-Italian Marconi (his mother was a Jameson from County Wexford) made practical sense of the existing hodge-podge of radio knowledge and came up with an exciting new way for man to communicate.

He was an enthusiastic yachtsman, so it was only natural that many of his achievements involved the sea—his contacts with Italian warships in the Mediterranean; the relaying to New York newspapers of the 1899 America's Cup race results (Sir Thomas Lipton's first-of-a-line of *Shamrocks* lost three straight to the *Columbia*). Thus, it came as no surprise when Marconi prepared to bridge the Atlantic with his "invention."

As if that code-letter "S" flashed from England to Newfoundland in 1901 meant "Start," the tinker-minded American male was off in a race to imitate, improvise and improve. The ham was born and the appeal was universal.

Magazines (even the *Woman's Home Companion* and the *Atlantic Monthly*)

First of the "Expedition Hams," Don Mix, W1TS went to the Arctic with Commander MacMillan in 1923. Subsequent expeditions to the polar regions always included hams. Don is still active and works in ham radio at ARRL headquarters in Newington, Conn.

were infected with the excitement of radio and well over a hundred articles in the first four years of the 1900's made America aware something was afoot.

"God's power is loosed," thundered one editorial. "Does Man know what he is doing?" Man didn't know, but there was only one way to find out—experiment!

The disputed coherer was left behind as Fessenden invented the "liquid barretter" and Marconi devised the magnetic detector. Pickard discovered the strange ability of silicon to detect radio signals and General Dunwoody found that carborundum would do the same. Poulson was burning out carbon microphones modulating a high-frequency spark (Fessenden and Collins had some success earlier) proving the human voice could be sent through the air.

Then 33-year-old Lee DeForest stole everyone's thunder by performing major surgery on Fleming's "valve" and inserting that vital third element, the grid, which made modern radio possible. In this wonderful, enchanting time it seemed miracles would never cease.

Jamming is Born. "It was a mess," recalls one pioneer ham. "Whenever a commercial station would come on the air, I would jump right down his throat. The only time he got a message through was when I was asleep!"

The U.S. Navy stations didn't get any better treatment at the hands of radio hams. It was total war. Twenty-eight bills to regulate radio had been introduced into Congress by 1912. The Alexander bill passed and was signed into law by President Taft on August 17, 1912. The hams were taken firmly by the hand and led up the frequency path, a road they were to travel many times.

Revenge was sweet as the Department of Commerce and Labor banished the amateur to the forbidding land of 200 meters. There, the ham ate crow and, to his surprise, found it pretty good—200 meters was better than 500 meters! With a sly smile on his face, he went to work to see just how far he *could* go.

America went to war and the amateur had work to do. The ARRL dramatically found 500 radio operators for the Navy in ten days and over 4000 experimenters went to war. In Paris, Armstrong invented the superheterodyne. After that, it looked as if the ham might be off the air for good. Commercial stations were released from the war-imposed shutdown on March 1, 1920. The ham was told he could *listen* on April 20.

Then, on September 26, 1920, all amateur restrictions were lifted and workshops sprang up everywhere as people began building radio receivers and transmitters of all sorts—

You'd be sitting in the living room reading the evening paper when a scream from the basement would make you jump and you'd know Dad had gotten across the high voltage again.

You'd go downstairs, pick him up, dust him off and give him a glass of water. He'd shake his head, go "ugh" and stagger back to the bench—and darned if he wouldn't do it all over again!

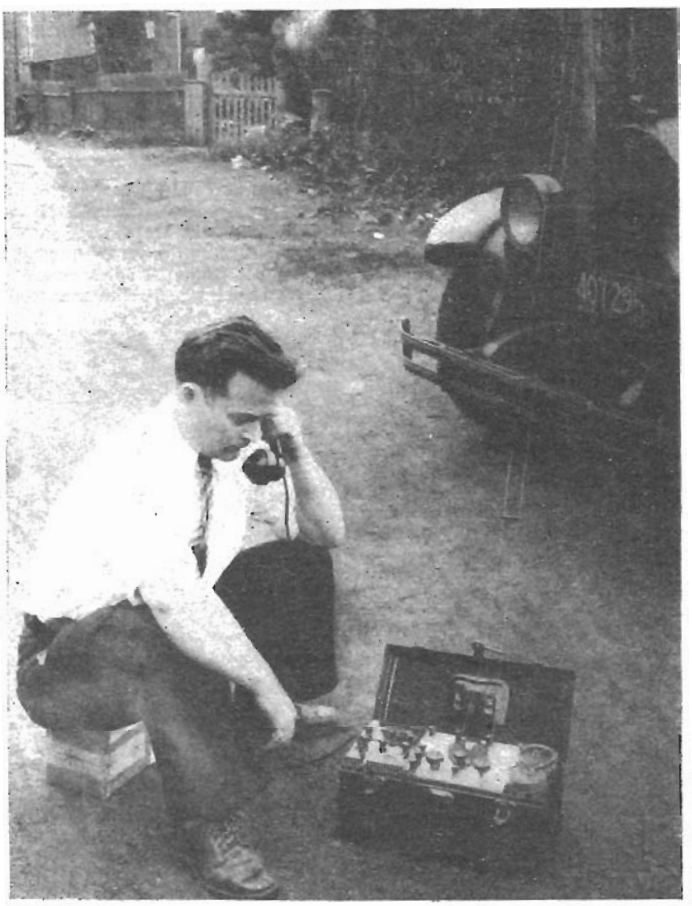
America was in the fabulous twenties. Excitement was everywhere. New things were happening and everyone wanted to be part of it all.

Even staid Bristol, Connecticut caught the fever when it learned the young radio operator at 40 Stearns Street had been chosen to go to the arctic with Commander MacMillan. First of a long line of "Expedition Hams," Donald H. Mix (1TS) was aboard when the schooner *Bowdoin* sailed from Wiscasset, Maine in June 1923. From Greenland's remote Refuge Harbor, Don Mix (using a Zenith-donated station and the call WNP) made the first ham-style arctic contact Sept. 9 with Jack Barnsley (9BP) in Prince Rupert, British Columbia.

The first amateur trans-Atlantic two-way took place on November 27, 1923 between Leon Deloy (8AB) in Nice, France, and Reinartz and Schnell (1XAM) in Connecticut. Fellow Yankee, Don Mix knew about it right away. Greetings from Deloy were relayed to him (8AB/1XAM/1HX/6XAD/9BP/WNP) that same evening!

But there was more involved than the spanning of the Atlantic. *This historic QSO took place on 100 meters.*

"That was the important thing," a two-letter ham writes, "100 meters. If that hadn't happened we'd still be there on 200. Hams are hard to move!"



This is what a portable transceiver looked like in 1933. The antenna was mounted on a wooden pole supported by the car radiator—not exactly a mobile installation. (Photo: National Radio Company, Inc.)

Allocations Are Made. The department of Commerce (by then amateur radio's Great White Father) took advantage of the momentum and made the following amateur allocations in 1924:

75-80	meters	3500-4000	kHz
40-43	"	7000-7500	"
20-22	"	13600-15000	"
4-5	"	60000-75000	"

Not only were the hams going *up,* they were going *way* up! The 4-5-meter band was in the never-never land and the Department of Commerce *hoped* they'd take the bait. But the hams had other ideas. Their beloved infant, spark, was forbidden on the new bands.

"Bad enough to put us so high in frequency," said the disgruntled ham, "that we're bound to get a nosebleed every time we call CQ, they gotta take spark away from us. I might not even renew my license!"

"I have news, cousin," cooed the Department of Commerce. "To use these bands you'll have to get a *new* license. One that states which band you're going to use *and you have to have the equipment to do it!"*

The ham's jaw dropped. New licenses? Not him! They could keep the whole shootin' match. Nevertheless, the following year the bands were changed to:

1500-2000	kHz
3500-4000	"
7000-8000	"
14000-16000	"
56000-64000	"

Later, in 1925, 400-401 *megacycles* (now megahertz) was authorized. This left most amateurs cold.

The new bands proved their worth, however, and DX took its place in the sun. Station 6AWT was using 5400 watts d.c. input! But all hams were amazed when Loren Windom (8GZ) in Columbus, Ohio made 0.567 watts reach 10,100 miles to A5BG on December 30, 1925. Windom followed this up, using 0.54 watts, to contact Capetown, South Africa and 0.493 watts to work George Shrimpton (Z2XA) in Wellington, New Zealand.

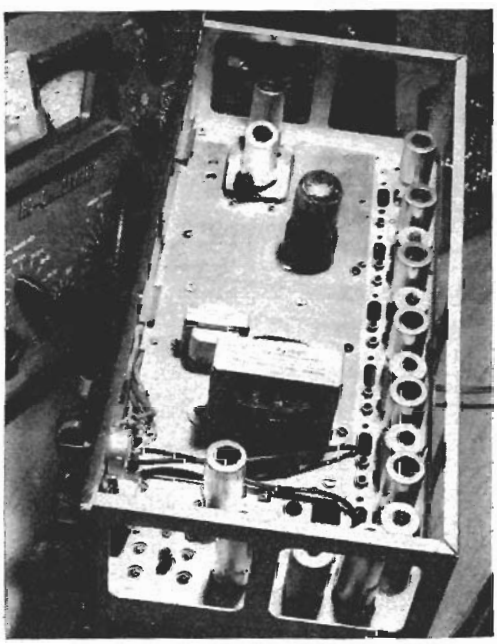
In 1927, the Federal Radio Commission took over from the Department of Commerce and came out of the International Radiotelegraph Conference with the first truly "amateur" regulations. Although the treaty that resulted from that conference wasn't to be effective until Jan. 1, 1929, General Order #24 (March 7, 1928) made the following allocations:

1715-2000	kHz
3500-4000	"
7000-7300	"
14000-14400	"
28000-30000	"
56000-60000	"

The "harmonic ladder" pattern was now firmly established. So was the governmental hand in ham affairs. The twenties were going, the thirties were coming and, if you looked closely, you could see cracks beginning to appear in the framework of amateur radio.

Old voices and familiar fists began to disappear one by one as amateur radio found itself in the depression doldrums. For some reason the second World War didn't have the same effect on amateur radio that the first one did. To make matters worse a plague of locusts descended on the hobby after World War II. Television interference (TVI) appeared to harass the ham. The bands festered and exploded in a rash of grass fires. Incentive licensing proposals jostled their way through the ranks trying to sep-

When electronic surplus was dumped on the market after World War II, it looked as if hamdom on the VHF/UHF might have an explosive growth; but it did not. Some VHF/UHF equipment was too specialized and most people went back to lower frequencies. This surplus APS/13 cost WA2NDN only one dollar —the tube shields alone are worth more than that.



arate the technical sheep from the rag-chewing goats. Dissatisfaction with ARRL policies added to the confusion and SSB vs AM spats cut the ham hocks to ribbons. Somewhere along the line something had happened to ham radio.

The Slums on Radio. "The present ham bands—and by that I mean 80, 40, and 20—have become slum areas," says an FCC engineer (and ham). "It's an electronic ghetto! Why do they stay on these same three bands. Look here," as he opened Part 97, "at what they have in UHF."

It's a vast, unexplored territory, inhabited by a small handful of hardy souls who get awfully lonely. Experimenters in VHF and UHF don't have time to talk about incentive licensing. They're wrapped up in the wonder and excitement of the new things they're finding every day.

Look at it another way:

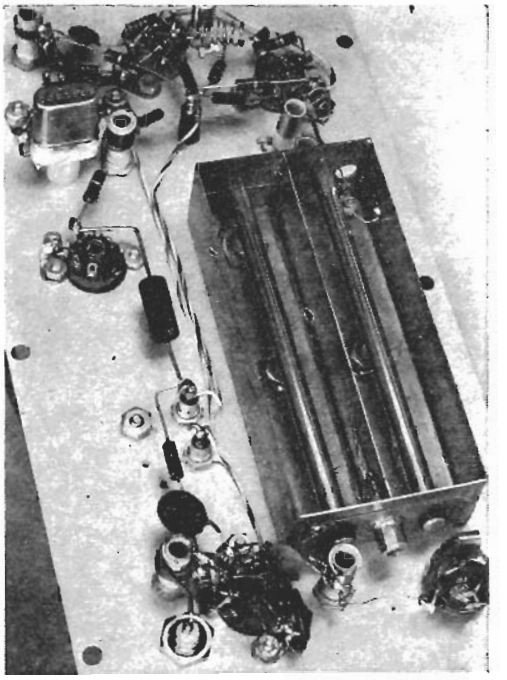
BAND	SPREAD
220-225 MHz	25 MHz
420-450 "	30 "
1215-1300 "	85 "
2300-2450 "	150 "
3300-3500 "	200 "
5650-5925 "	325 "
10000-10500 "	500 "
21000-22000 "	1000 "

Now the 80 through 10 spectrum:

BAND	SPREAD
3500-5000 kHz	500 kHz
7000-7300 "	300 "
14000-14350 "	350 "
21000-21450 "	450 "
28000-29700 "	1700 "

A total frequency spread of 3300 kHz *—less than ⅓th the spread on just one (220-225 MHz) "VHF-and-up" band!*

Life in the Higher Altitudes. But there's more to these frequencies than just the lure of the unknown and plenty of space to roam around. First, they can be tailor-made to suit your individual purpose. With low power and vertically polarized antennas (and FM emission) the VHF/UHF are admirably suited for local work. This gives hams an interference-free talk-tool for local nets. CB'ers have made hams look foolish while providing emergency communications using battery-powered miniaturized equipment. They would have all of the marbles if it weren't for the QRM. The VHF/UHF arena is the ideal spot for equipment experimentation. Hams have the frequency space—but the 80, 40, and 20 diehards lack initiative.



Tank circuit from ARRL Handbook is an example of UHF simplicity. Not complex—more hams could find building this type of equipment a real challenge.

What About Propagation? There is still a lot we don't know about VHF/UHF DX/ing, or scatter, or sporadic-E, or auroral refractions, etc. And moon bounce is just getting interesting—those two dozen hams working here certainly aren't complaining about QRM.

There's nothing to stop a ham from building his own radar or satellite tracking station. Amateur TV was going places until someone thought up the idea of low-frequency slow-scan (that's right, diehards, don't push VHF/UHF). Antennas directly coupled to solid-state devices are coming on strong, but hams aren't experimenting with them.

The enchanting aura of the adventure of amateur radio clings to every particle of VHF, UHV, SHF, and EHF. If hams fail to heed its siren call, they fail as radio amateurs!

The time has come to turn to the frontiers of radio as hams once did. *There* is where history is being made! —30—

World of Amateur Radio

The Moscow way of licensing

At a time when the h.f. bands are less frequently open to DX I find that a high percentage of all my contacts seem to be with amateurs in the USSR where activity and standards of operating are high and where many amateurs seem to be using home-built transceivers. Considerable official encouragement is given to amateur radio in the USSR including access to surplus equipment and technical information. But at the same time by British standards the licensing is very much on an "incentive" basis and demands considerable effort on the part of those wanting licences.

A recent survey of Russian licence conditions in *Electronics Australia* shows that the Muscovite's path to a first-class licence is long and arduous. In essence the procedure is: complete a basic electronics course; join a radio club and take a test (including a 10 w.p.m. Morse test) which licenses you to *listen* on the amateur bands and log stations; after six months you can take a "third-class" test (more difficult examination on simple transmitter theory and practice and 12 w.p.m. Morse test). If you pass this you are permitted to operate a 10-watt transmitter on sections of the 3.5 and 7MHz bands c.w. and 28MHz phone. These licences can be renewed only by the operator moving to a higher class. To do this requires another ("second-class") examination and a pass allows operation of a 40-watt transmitter on 3.5 to 420MHz c.w. (phone restricted to 28MHz). Finally to obtain a "first-class" licence requires the applicant to send and receive Morse at 18 w.p.m., be able to design transmitter and receiver circuits, and build and service advanced transmitters and receivers. If he or she (for some 10% of Russian amateurs are "YLs") passes, then permission is given to operate 200 watts on 3.5 to 420MHz c.w. or phone (there are no 1.8, 50 or 70MHz bands available in Russia – I am not certain about microwave bands).

V.h.f. going factory-built

Not so long ago it was common practice for v.h.f. enthusiasts to claim that their bands had become the last refuge of those who liked to build their own equipment (although in practice reception usually depended on a home-built converter in front of a commercially-built h.f. communications receiver). But there is plenty of evidence to show that factory-built equipments are today becoming almost as widely used on 144MHz as on 14MHz. In the last two or three years there has been an influx of v.h.f. transceivers such as the Yaesu FT-2 series, Trio TR7200 and TR2200 and kit units such as the Heathkit HW202, 144MHz transverters, Inoeu and Icom units such as the IC22 and IC210 with its phase-locked v.f.o., the Liner 2 transceiver that has enormously increased the amount of s.s.b. on 144MHz, and a growing number of 144MHz hand-held units for working direct or through repeaters.

One wonders whether, in the face of this invasion, the home-builders will tend to retreat to the u.h.f. bands or subscribe to the growing interest in microwaves.

Ionospheric storms in a quiet year

Recent months have been marked by pronounced 27-day repeats of pretty severe magnetic storms. They start off with a steep rise in maximum usable frequencies, leading on to auroral effects and then followed by several days of disturbed conditions and low m.u.f., particularly on the North Atlantic paths. It has of course long been recognised that the 27-day repetition period of these storms allows them to be predicted with good accuracy during the decreasing phase of the sunspot cycle. But one certainly has the feeling that the storms have been more severe this year than one would expect in what many regard as "a year of the quiet sun".

For example, October 12 saw a high m.u.f. with the 28MHz band opening well to Australia and Japan; this was soon followed by Aurora openings on v.h.f. and then a lengthy period of subdued h.f. conditions.

Clamping down on Citizen's Band violations

The American FCC appears to be taking seriously a series of measures aimed at better regulation and supervision of 27MHz CB operation where in the past the Class D regulations have been honoured mostly in the breach. For example the Commission has recently set up four specially equipped and trained enforcement teams; obtained a well-publicised series of criminal convictions for gross violations; established temporarily some 40 special inspection stations to check the use of CB equipment by lorry drivers (of 36,000 vehicles checked about 7,000 were carrying 27MHz CB equipment, more than half unlicensed and many others exceeding the power regulations). There are current proposals in the United States to prohibit the sale or importation of linear amplifiers in the 20 to 40MHz range as these are being widely used to run high-power CB stations.

However, there are also proposals to increase the number of 27MHz channels (adding 27·23 to 27·54MHz), to permit the use of omnidirectional aerials at heights up to 60ft (20ft will still be the limit for beams) and to relax some of the restrictions on hobby use of Citizen's Band.

Type approval of amateur gear?

One aspect of so much amateur equipment now coming from factories rather than being built on the kitchen table is the question of whether this is likely to lead to the introduction of some form of type approval, type acceptance or recognised "performance standards". Probably the main question is that of the levels of spurious emission outside of amateur bands, a factor that has been emphasised by the more general use of mixing processes rather than straight frequency multiplication in transmitter practice. It is by no means unusual, even in reputable designs, for there to be spuriae of the order of −40dB or so with reference to wanted output. This may or may not result, for example, in interference to television reception or to other communication services; much depends on what additional suppression is provided by the operator in the form of filters or resonant aerials. But there is an argument that if equipment is sold for amateur operation should it not be expected to be suitable, without additional suppression, for use at all normal locations?

One answer might be for the licensing authorities to insist that all equipment conformed to a published performance specification, but where would this leave the amateur who wishes to modify equipment and lacks measuring equipment to ensure that the performance is still within spec?

The ARRL Board of Directors recently decided that if any form of type approval is instituted in the United States the League would urge continuation of the amateur's right to build, to modify and to adapt surplus equipment to his own use.

In brief

The installation of the RSGB president for 1975 (C. H. Parsons, GW8NP) will take place at Cardiff on January 17 . . . Nobel prize winner Sir Martin Ryle holds the amateur callsign G3CY . . . The final RSGB 144MHz contest for 1974 takes place on December 8 . . . Microwave operating awards are issued by the RSGB for the first contact an amateur makes over the following distances: 13-cm band 500km; 9-cm 400km; 6-cm 300km; 3-cm 150km; and 15-mm 150km . . . "I would like to voice my personal firm support of the Amateur Radio Service," from a recent address by Richard E. Wiley, chairman of FCC . . . Over 1,000 repeater stations have been licensed in the United States, making this the fastest growing segment of amateur radio, and it seems likely that restrictions on the linking of repeater stations may be lifted, together with those relating to cross-band operations.

PAT HAWKER, G3VA

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THINGS are happening in surplus; the system has churned like a cauldron for months, and late in the Spring began to spew forth more and more material after a federal freeze which distressed a lot of the larger dealers. As I reported last winter, "demilitarization" orders held up disposal of vast quantities of electronics and other items, but the lid was off by April, and the stores should be full by the time this column is printed.

Things were bad for a while. So meager was the surplus supply that the Institute of Surplus Dealers cancelled its Miami Beach trade show for the first time in 33 years.

On the way to the Dayton Hamfest I checked around a bit in the northeast and midwest, and found that things were better, that Uncle Sam was pushing out the goodies in the old style, and that even a better grade of surplus electronics may be expected in coming months.

No real post-war boom is likely because of Viet Nam. The phasedown from southeast Asia has already happened, and it was nothing like 1945-46, as old timers will recall. There are new developments coming though.

Right now, anyone who bids on government lots is aware that the new Defense Property Disposal System has consolidated its offices into regional centers, doing away with offices in such places as Philadelphia and Norfolk. This is pretty much a paperwork change as far as we are concerned.

*1502 Stonewall Rd., Alexandria, Va. 22302

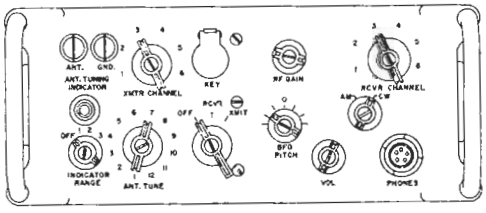


Fig. 1—Front panel drawing of the AN/TRC-77 tactical transceiver.

A lot more important change is in the wind, as the Pentagon implements a policy of scrambling *all* voice communications.

The Defense Department has just banned the procurement of any voice radios or telephones that are not capable of putting sophisticated scrambling on their channels. What this means is that billions of dollars worth of gear, from aircraft emergency transceivers to telephones in the Pentagon will have to be bought with scramblers either installed or available.

Assistant Secretary of Defense Eberhardt Rechtin told reporters here that voice communications (as a lot of old Army types have long known) are the worst security problem in the military.

Rechtin said he thought most new gear would be bought with scramblers built in, although some would be added-on. Of course all that non-scrambler gear will become surplus sooner or later.

Larger-scale-integration has made scramblers practical for tactical voice radio, with the devices as small as a pack of cigarettes, and able to make voice communications sound like atmospheric noise. These units are a long step beyond 1950-era scramblers which inverted the speech but did not hide it from a determined enemy. The latest devices mask its existence, and make it far harder to "break." This equipment first came to light in a seven foot tall relay rack device made by National Radio Company, but solid-state has reduced it to a small fraction of its former size.

The Pentagon says the scramblers will cost about the same as the transceivers they are attached to.

Another potential development in the surplus markets could—just could—bring a surplus store to some communities which are located so far from a government depot that they have not been able to support a surplus business before. Sanford Mendelson, of Dayton, would like to set up "franchise" surplus outlets in cities where there are no surplus dealers. Like the McDonald's hamburger people, he would supply the merchandise, which he buys in carload lots, and a local entrepreneur would sell it.

Mendelson would like to have anyone interested in the idea write him and discuss the plan. He is located at 516 Linden Ave., Dayton, Ohio, 45403. There is no doubt that Mendelson has the gear—I saw a couple of warehouses full in April, and Sandy said more was pouring in every day.

The unit I want to describe this month is the AN/TRC-77, a tactical transceiver that is showing up more and more frequently. I saw the set at Mendelson's and at Dayton Surplus, 1001 E. Second Street, in Dayton. I have heard from several readers that the sets are showing up widely in MARS and other sources.

This is a small (12 pounds) portable set (fig. 1) covering the 3-8 mHz band, with six crystal-controlled channels. The military estimates that the range is from 5 to 7 miles, with the usual inadequate field antenna. Power output is from 10 to 14 watts and sensitivity on c.w. of the receiver portion is rated at 1 microvolt for 1.0 signal plus noise to noise ratio (Those are the Army's terms, not mine.)

The intermediate frequency is 455 kHz, and the set does have a b.f.o.

The components include the RT-654 and 654A/TRC-77 transceiver, an AT-1098 antenna, battery BB-447, H-140-A headset, and various cables and accessories. The battery case (wet cells) is usually clamped to the base of the transceiver when in use. Alternatively, any 12 volt d.c. power source may be used with the TRC-77.

The TRC-77 uses 3B4WA and 2E24 tubes in the transmitter. The receiver is fully transistorized.

The maintenance manual is *TM 11-5820-473-12.* ■