

# 2 DOMESTIC ARMS PRODUCTION

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ALTHOUGH THE smaller and poorer nations of South and Central America generally rely on imported arms to satisfy their military needs, the larger and wealthier nations of the region produce a wide variety of small arms and light weapons. Indeed, Latin America has a long tradition of small arms production, with some manufacturers tracing their history back many decades. The *Fábrica Nacional de Armas* of Mexico, for instance, has been manufacturing rifles in Mexico City since before World War I, and the Argentine arms industry can trace its roots to the mid-19th century. At present, light weapons of one type or another are produced at private or government-owned factories in Argentina, Brazil, Chile, the Dominican Republic, Mexico, Peru, and Venezuela. Together, these plants are capable of producing hundreds of thousands of weapons per year (see Table 2.1).

The development of munitions factories in Latin America is a product, in many cases, of the military's belief that self-sufficiency in armaments manufacture is an essential precondition for national sovereignty. This view has long been held by the armed forces of the major European nations, and was undoubtedly communicated to Latin American military officers in the late 1800s and early 1900s when the European powers—especially Germany, Britain, and France—provided military training and advice to the Latin American armies. As the latter have achieved greater power and influence over the governments of their respective countries—a pattern seen in many Latin American countries over the past 75 years—they have often invested public funds in the establishment of national arms industries.<sup>1</sup> And because the militaries in these countries have been concerned primarily with internal security and border protection, they have naturally stressed the development of small arms and other infantry-type weapons.

The establishment of weapons industries is also seen by the leaders of some Latin American countries as a means of promoting modernization and development. Arms industries are thought to be useful for this purpose because they generate new products

for export and because they stimulate the development of ancillary industries in the civilian economy, for instance in electronics, aircraft production, metallurgy, and shipbuilding. This view is especially widespread in Brazil, where the government has established a state-owned conglomerate, IMBEL (Indústria Brasileira de Material Bélico) to expand domestic arms production and to market Brazilian military products abroad.<sup>2</sup> Much of the resulting investment, especially in Brazil, has been focused on the development of aircraft and missiles, but the light weapons sector has also benefitted. This is particularly evident in Chile and Peru, which lack the resources for aircraft and missile production but which have succeeded in establishing viable small arms industries.<sup>3</sup>

Although several of the Latin American arms producers have sought to attain true self-sufficiency—entailing the indigenous design, as well as production of armaments—most of the light weapons now being produced in the region are derived from U.S. or European designs. Typically, this involves the acquisition of a license and production know-how (and, in some cases, production equipment) from the original manufacturer. For example, the widely popular FAL assault rifle, originally produced by the Fabrique Nationale Herstal of Belgium, is (or has been) license-produced in Argentina, Brazil, Chile, Mexico, and Venezuela.<sup>4</sup> Latin American arms firms also produce a wide variety of pistols, revolvers, and machine guns under license from companies in the United States and Europe.

Nevertheless, Latin American producers have, on occasion, demonstrated a capacity to design and produce weapons of international appeal. The first gas-operated auto-loading rifle to be used in regular military service by a European army, the *Fusil Automatico de 7 mm 'Porfirio Diaz'* of 1908, was invented by a Mexican Army officer, Manuel Mondragon.<sup>5</sup> More recently, the Brazilian weapons designer Olympio Vieira de Mello developed several light weapons with broad international appeal, including the 9 mm *Uru* submachine gun and the 7.62 mm *Uirapuru* machine gun.<sup>6</sup> Designers in Argentina, Chile, and Peru have also introduced weapons that have found a market in other countries.<sup>7</sup> When speaking of the "arms trade in Latin America," therefore, we must consider sales *by* Latin American countries as well as *to* them.

Although the nations of Latin America will continue to procure small arms and light weapons from external suppliers, it is likely that they will rely increasingly on the output of their own factories and on arms acquired from other states in the region. It is useful, then, to examine the arms pro-

### **Table 2.1**

<b>Light Weapons Production in Latin America</b>							
(x = at least one model of this weapon produced)							
	pistols, revolvers	rifles	submach- ine guns	machine- guns	hand grenades	land mines	mortars
Argentina	x	x	x	x	x	x	x
Brazil	x	x	x	x	x	x	
Chile	x	x	x		x	x	x
Colombia		x					
Dom. Rep.		x					
Guatemala		x					
Mexico		x	x				
Peru			x			x	
Venezuela	x	x					

Sources: *Jane's Infantry Weapons 1995-1996*, *Rifles of the World*.

duction capabilities of Latin American countries. (See Appendix for a comprehensive list of light weapons manufactured in Latin America.)

## Argentina

Argentina has been producing arms of one sort or another since the late 19th century, and, in the 1930s, established a large and diversified military-industrial complex under the overall supervision of the Dirección General de Fabricaciones Militares (DGFMM).<sup>8</sup> Small arms production in Argentina is centered at the state-owned Fábrica Militar de Armas Portátiles "Domingo Matheu" (FMAP) in Rosario, Santa Fe, known as FM Domingo Matheu or simply Rosario. (Domingo Matheu was a 19th century Argentine military leader who was active in the early development of the nation's arms industry.) This facility has been in operation since before World War II, and today manufactures a wide range of small arms and ammunition.<sup>9</sup>

FM Domingo Matheu began producing German-type Mauser bolt-action rifles—the *Fusil Mauser Argentino Modelo 1909*—in 1942, when direct arms imports from Europe were cut off by the war; an estimated 85,000 Mausers were produced at Rosario between 1945 and 1959.<sup>10</sup> In 1960, FMAP began producing the Belgian-

designed, auto-loading 7.62 mm *Fusil Automatique Léger* (FAL) under license from Fabrique Nationale Herstal (FN), the leading Belgian small arms producer. Several variants of the FAL have been produced at Rosario, including the standard model and a folding-butt "para" model; all told, some 120,000 of these rifles were manufactured between 1960 and 1983, and production of most types continues.<sup>11</sup> The Argentinians also manufacture the 7.62 mm FN MAG machine gun under license from Fabrique Nationale, along with a light machine gun, the *Fusil Automatico Pesado* (FAP), based on the FAL.<sup>12</sup>

In addition, FMAP produces a variety of pistols and submachine guns. From 1927 to 1942, an estimated 38,000 copies of the Colt M1911 .45 cal. pistol (known locally as the *Pistola Sistema Colt Modelo 1927*) were made at Rosario; another 75,000 were produced in 1947-1966 (some of which were still in service with elements of the Argentine military during the Falklands/Malvinas war in 1982).<sup>13</sup> Since 1969, the standard sidearm of the Argentine military has been the 9 mm Browning High Power pistol (model 1935 GP), manufactured under license from Fabrique National Herstal; an estimated 183,000 of these pistols had been produced by the mid-1980s, and production continues today. FMAP also manufactures a locally-designed 9 mm submachine gun, the FMK-3, of which some 30,000 had been produced by 1991; before that, Rosario had turned out an estimated 50,000 PAM-1 and PAM-2 submachine guns (a variant of the U.S. M3A1).<sup>14</sup> Combat grenades, including the GME-FMK2-MO hand grenade, are also manufactured at Rosario.<sup>15</sup>

A number of heavier infantry weapons are manufactured at the Fábrica Militar in Rio Tercero, Cordoba. These include the 105 mm Model 1974 FMK-1 Czekalski recoilless rifle, a locally-designed anti-tank weapon mounted on a wheeled carriage, and several types of light mortars (see Appendix). In addition, Argentina's Instituto de Investigaciones Cientificas y Technicas de las Fuerzas Armadas (CITEFA) in Buenos Aires has produced a wire-guided man-portable anti-tank missile, the *Mathogo*, and is also reported to be developing a more advanced version with a semi-automatic line-of-sight guidance system, the CIBEL 2K.<sup>16</sup>

## Brazil

Brazil was slower than Argentina to develop modern military industries, but in the 1970s it laid the foundations for a large and technologically advanced military-industrial complex. IMBEL, which assumed control over all state-owned arms facilities in 1975, was empowered by the government to expand domestic military production and to launch new industrial enterprises. This resulted in the introduction of a number of major weapons systems, including aircraft, armored vehicles, and missiles, along with a wide

variety of small arms and light weapons.<sup>17</sup>

During World War II, Brazil sent a contingent of soldiers—known as the Brazilian Expeditionary Force (BEF)—to fight on the allied side in Europe and, as a result, was provided with a large quantity of U.S. M1 rifles and other light weapons. The United States continued to supply Brazil with M1s after the war, via the Military Assistance Program (see chapter 3). In the early 1960s, the Brazilian military decided to replace the M1 with the Fabrique Nationale FAL 7.62 mm automatic rifle, and a contract was subsequently signed with FN Herstal to permit licensed production of the rifle at the government's Fábrica de Armas in Itajubá, Minas Gerais state. (This plant, like other government-owned arms factories, was later placed under the control of IMBEL.) At least 200,000 FALs of various types were produced between 1964 and 1983, and production continues at Itajubá. IMBEL also makes two 5.56 mm versions of the FAL, the MD2 (with folding butt) and MD3 (with a fixed plastic butt).<sup>18</sup>

Handgun production at Itajubá began in 1965, with a domestic copy of the .45 cal. Colt M1911A1 pistol—the sidearm provided to Brazilian troops in the BEF. In 1975, following a decision by the Brazilian Army to convert all sidearms to 9 mm ammunition, the M1911A1 was reconfigured to fire this bullet; the resulting weapon, the IMBEL M973 pistol, is still in production, with some 50,000 units already in service.<sup>19</sup> The Brazilian military also employs another 9 mm pistol, the 15-shot Beretta Model 92, which is manufactured under license from Beretta of Italy by Forjas Taurus SA, a leading Brazilian producer of pistols and revolvers.<sup>20</sup> Taurus is a major supplier of handguns to the domestic U.S. market, shipping some 230,000 pistols and revolvers to the United States in 1993 alone.<sup>21</sup>

Brazilian firms produce several types of machine guns and submachine guns for both domestic use and export. In the 1950s, the government-owned Indústria Nacional de Armas (INA) of Sao Paulo began production of the .45 cal. Madsen Model 1950 submachine gun (also Model 1953) under license from Dansk Industri Syndikat of Denmark; IMBEL's Fábrica de Itajubá later developed a 9 mm variant, which remains in production.<sup>22</sup> Another European submachine gun, the 9 mm Beretta Model 12, is produced under license by Forjas Taurus. An indigenously designed submachine gun, the 9 mm *Uru*, was developed by Olympio Vieira de Mello in the late 1970s, and a private firm, Mekanika Indústria e Comércio Ltda., was set up to produce it. Mekanika also undertook production of the de Mello-designed *Uirapuru* machine gun. Much admired for their simplicity and ease of operation, the *Uirapuru* and *Uru* have been sold to foreign customers as well as to the Brazilian armed forces.<sup>23</sup>

As in Argentina, Brazilian firms produce a variety of other light weapons. These include a number of light mortars (60 mm, 81 mm, and 120 mm), a copy of the U.S. 57 mm M18A1 recoilless rifle, and a copy of the U.S. 3.5 in. M20A1 rocket launcher.

In addition, Hydroar SA of Sao Paulo manufactures a backpack-type flamethrower, the LC T1 M1.<sup>24</sup> Combat grenades of various types (including hand grenades and anti-tank rifle grenades), plus a full range of mortar shells, are produced by the Companhia de Explosivos Valparaiba (CEV) of Rio de Janeiro.<sup>25</sup> Lastly, anti-personnel land mines are manufactured by Quimica Tupan SA, a company founded by retired Brazilian military officers in 1957.<sup>26</sup>

## Chile

Although building on a much leaner industrial base than Argentina and Brazil, Chile has succeeded in establishing a small but vibrant weapons industry capable of producing a variety of light and medium weapons. Most of this activity is concentrated in the Army's Fábricas y Maestranzas del Ejército (FAMAE), located in Santiago. Greatly expanded during the 1970s, when many nations suspended arms deliveries to Chile in response to the violent overthrow of the Allende government, FAMAE now makes handguns, rifles, submachine guns, mortars, and grenades. Several private firms, most notably Industrias Cardoen SA of Santiago, are also active in the light weapons field.<sup>27</sup>

In the 1960s, FAMAE joined Argentina and Brazil in producing the FN FAL rifle under license from Fabrique Nationale Herstal. In the early 1980s, however, FAMAE obtained a license from the Schweizerische Industrie-Gesellschaft of Switzerland to produce the SG540 series assault rifle. FAMAE currently produces two variants of this weapon: the SG540, designed for 5.56 mm ammunition, and the SG542, designed for 7.62 mm ammunition.<sup>28</sup> FAMAE also produces a .38 cal. "Special" revolver and a submachine gun based on the SG540, the 9 mm SAF.<sup>29</sup> These, and other FAMAE-produced weapons, were reportedly part of an 11-ton shipment of Chilean munitions sent to Croatia in November 1992 in violation of the U.N. arms embargo on the former Yugoslavia.<sup>30</sup> (This shipment was not actually completed, as the plane carrying the weapons was forced down in Budapest while on route to Zagreb.)

In addition to small arms, FAMAE produces a variety of mortars, mortar shells, and land mines. Current production includes the 60 mm Commando mortar, the FAMAE 81 mm mortar, and the FAMAE 120 mm mortar; ammunition for these mortars is produced by FAMAE under license from Thomson-Brandt Armements of France.<sup>31</sup> Industrias Cardoen, a company with roots in the mining business (which employs large quantities of explosives), manufactures a range of grenades, bombs, and mines. Grenade production includes the Cardoen offensive/defensive hand grenade, the Mk-2 hand grenade, and the "Mini" hand grenade.<sup>32</sup> Cardoen also produces a number of cluster bombs, some using materials and technology obtained through illicit means from the United States; in 1993 the company (along with founder

Carlos Cardoen) was indicted by the U.S. Department of Justice for illegally incorporating U.S.-origin materials and components in some 24,000 cluster bombs sold to Iraq in the mid-1980s.<sup>33</sup> The company now operates as Metalnor, SA.

## **Dominican Republic**

The Dominican Republic is not a country one normally associates with weapons production, but, since 1948, it has housed a small arms factory at San Cristobal. Established by the exiled Hungarian arms designer Pal Kiraly, the Armeria San Cristobal has produced the Beretta Model 1938 submachine gun and a Kiraly-designed automatic rifle, the .30 cal. Model 2 Cristobal. An estimated 200,000 of the Model 2 have been produced, with some absorbed by the Dominican military and the rest sold to other countries in the region, including Cuba.<sup>34</sup> There is also an unconfirmed report that the Armeria San Cristobal undertook manufacture of the U.S.-designed Ingram Model 10 submachine gun in the 1980s.<sup>35</sup>

## **Mexico**

Mexico has long produced rifles and other light weapons but has not developed a large and diversified military industry. The state-owned Fábrica Nacional de Armas manufactures light weapons only, and private arms production is essentially limited to small arms and light armored vehicles. Most of Mexico's other weapons are imported, either from the United States or the major European suppliers.<sup>36</sup>

The Mexican government ordered large quantities of Mauser-type rifles from Germany in the years leading up to World War I, and then, in 1913, began producing them at the Fábrica Nacional in Mexico City. Bolt-action Mauser rifles were produced until the 1950s, when the Mexican government sought to equip its forces with automatic weapons.<sup>37</sup> Beginning in 1968, the Fábrica Nacional produced the 7.62 mm FN FAL automatic rifle under license from Fabrique Nationale Herstal. A decade later, Mexico acquired a license from Heckler and Koch of Germany to produce the 7.62 mm G3 rifle, and this remains in production today.<sup>38</sup> In addition, several types of light weapons have been produced by Productos Mendoza SA of Mexico City, including the 9 mm Model HM-3 submachine gun and the .30 cal. RM2 light machine gun.<sup>39</sup>

## **Peru**

Peru, like Chile, has attempted to establish a diversified munitions industry serving all three military branches (Army, Navy, Air Force), albeit with limited success. The

most notable of these enterprises is the Navy's Servicios Industriales de la Marina (SIMA), established in 1950. In addition to assembling naval craft of various sorts, SIMA maintains a small arms factory—the Centro de Fabricación de Armas—at the Callao Naval Base, near Lima.<sup>40</sup> This facility, known as SIMA-CEFA, produces a family of 9 mm submachine guns, including the MGP-79A, MGP-87, and MGP-84 "Mini." These weapons have been employed by paramilitary forces and security guards in Peru, and by equivalent units in other, unnamed Latin American countries.<sup>41</sup>

### **Other Countries**

Weapons production in the other Latin American countries is largely confined to land mines, small naval craft, and ammunition.<sup>42</sup> However, the Compañía Anonima Venezolana de Industrias Militares (CAVIM) of Venezuela has assembled FN FAL automatic rifles (using components supplied by Fabrique Nationale Herstal),<sup>43</sup> and produced a number of handguns under license from FN and U.S. firms.<sup>44</sup> Also, the state-owned arms industry in Colombia, Industrias Militar (INDUMIL), manufactures .32 and .38 cal. revolvers and is planning to produce a 5.56 mm automatic rifle—presumably a variant of the Israeli *Galil*—for the Colombian armed forces.<sup>45</sup> Finally, the Guatemalan army is reportedly assembling the *Galil* assault rifle (under license from Israel Military Industries) at the military complex of Santa Cruz in the Alta Verapaz Department.<sup>46</sup>

## Endnotes for Chapter 2

1. For background and discussion, see Augusto Varas, *Militarization and the International Arms Race in Latin America* (Boulder: Westview Press, 1985). See also V. Millán, "Argentina: Schemes for Glory," in Michael Brzoska and Thomas Ohlson, eds., *Arms Production in the Third World* (London: Taylor and Francis, 1986), pp. 35-54.
2. See P. Lock, "Brazil: Arms for Export," in Brzoska and Ohlson, *Arms Production in the Third World*, pp. 79-104.
3. See M. Brzoska, "Other Countries: The Smaller Producers," in Brzoska and Ohlson, *Arms Production in the Third World*, pp. 251-55, 268-70, 275.
4. Terry J. Gander and Ian V. Hogg, eds., *Jane's Infantry Weapons 1995-1996* (Coulsdon, U.K.: Jane's Information Group, 1995), pp. 113-14, 118-19, 120 (hereinafter cited as *Jane's Infantry Weapons 95-96*).
5. John Walter, *Rifles of the World* (Northbrook, IL: DBI Books, 1993), p. 201.
6. Ian V. Hogg, ed., *Jane's Infantry Weapons 1988-1989* (Coulsdon, U.K.: Jane's Information Group, 1988), pp. 75-76, 273-74 (hereinafter cited as *Jane's Infantry Weapons 88-89*).
7. The Chilean firm Industrias Cardoen, for instance, sold 24,000 of its 500-lb. cluster bombs to Iraq in the mid-1980s. See Shirley Christian, "Chilean Arms Maker Plays Role in Iran-Iraq War," *New York Times*, July 22, 1987.
8. See Millán, "Argentina: Schemes for Glory," pp. 35-39.
9. For background, see Edward Clinton Ezell, *Small Arms of the World*, 12th ed. (New York: Barnes and Noble Books, 1983), pp. 195-207.
10. Walter, *Rifles of the World*, p. 163.
11. *Ibid.*, p. 235. See also Ezell, *Small Arms of the World*, p. 196, and *Jane's Infantry Weapons 95-96*, p. 113.
12. *Jane's Infantry Weapons 95-96*, p. 233.
13. See *Jane's Infantry Weapons 88-89*, p. 2, and Ezell, *Small Arms of the World*, p. 195.
14. E. C. Ezell, et al., *International Small Arms Usage and Research and Development Trends*, Contractor Report ARCCD-CR-93001 (Picatinny Arenal, NJ: U.S. Army Armament Research, Development and Engineering Center, May 1993), Part I, p. 110 (hereinafter cited as Ezell, et al., *International Small Arms Usage*). See also *Jane's Infantry Weapons 95-96*, p. 73, and Ezell, *Small Arms of the World*, p. 199.
15. *Jane's Infantry Weapons 95-96*, p. 457.
16. *Jane's Infantry Weapons 95-96*, p. 298. These weapons reportedly incorporate foreign—probably German—technology. See Millán, "Argentina: Schemes for Glory," pp. 44-45.

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17. For background, see P. Lock, "Brazil: Arms for Export," pp. 79-104. See also Klaus Wolff-Casado Revuelta, "The Brazilian Defence Industry," *Military Technology*, October 1985, pp. 92-119.
18. Ezell, *Small Arms of the World*, p. 287. See also *Jane's Infantry Weapons 95-96*, pp. 121-22.
19. *Jane's Infantry Weapons 88-89*, p. 7; *Jane's Infantry Weapons 95-96*, pp. 8-9.
20. *Jane's Infantry Weapons 88-89*, p. 7. For background on Taurus, see Wolff-Casado Revuelta, pp. 116-17.
21. See James Brooke, "Brazil a Leading Supplier of Handguns to U.S.," *New York Times*, August 21, 1994. For descriptions of the Taurus guns on sale in the United States, with sample prices, see Ken Warner, ed., *Gun Digest 1996*, 50th ed. (Northbrook, IL: DBI Books, 1995), pp. 339-40.
22. *Jane's Infantry Weapons 95-96*, pp. 77-79.
23. Ezell, *Small Arms of the World*, p. 289. See also *Jane's Infantry Weapons 88-89*, pp. 75-76, 273-74.
24. *Jane's Infantry Weapons 95-96*, pp. 199, 299-300; P. Lock, "Brazil: Arms for Export," p. 90; Wolff-Casado Revuelta, "The Brazilian Defence Industry."
25. *Jane's Infantry Weapons 95-96*, pp. 472-73, 525. See also Wolff-Casado Revuelta, "The Brazilian Defence Industry," p. 100.
26. The Arms Project of Human Rights Watch and Physicians for Human Rights, *Landmines: A Deadly Legacy* (New York: Human Rights Watch, 1993), p. 92 (hereinafter cited as Arms Project, *Landmines*).
27. For background, see: M. Brzoska, "Other Countries," pp. 251-55; Adrian J. English, "Industry in Advance," *Jane's Defence Weekly*, March 7, 1992, pp. 410-11.
28. *Jane's Infantry Weapons 95-96*, p. 126.
29. *Ibid.*, pp. 10, 79-80.
30. From Santiago Television Nacional de Chile newscast, December 17, 1991, as translated by Foreign Broadcast Information Service (FBIS), LAT-91-242, December 17, 1991, p. 40. See also Nathaniel C. Nash, "Chilean Arms Shipment to Croatia Stirs Tensions," *New York Times*, January 11, 1992.
31. *Jane's Infantry Weapons 95-96*, pp. 353-54. See also English, "Industry in Advance," p. 411.
32. *Jane's Infantry Weapons 95-96*, pp. 474-75. See also English, "Industry in Advance," p. 413; Don Podestra, "Latin Weapons Industries Slip in Post-Cold War Chill," *Washington Post*, June 25, 1993.
33. U.S. Department of Justice, Criminal Division, Internal Security Section, Export Control Enforcement Unit, "Significant Export Control Cases, January 1981 to May 31, 1995" (mimeo), p. 48 (hereinafter cited as DOJ, "Significant Export Cases"). See also William Booth, "U.S. Accuses Chilean of Iraqi Arms Deal," *Washington Post*, April 7, 1992; and Andy Pasztor, "Investigators Say Chilean Dealer Smuggled U.S. Weapons to Iraq," *Wall Street Journal*, November 20, 1991.

34. See Ezell, *Small Arms of the World*, pp. 417-19; *Jane's Infantry Weapons* 88-89, pp. 139-40; and Walter, *Rifles of the World*, p. 55.
35. See Ezell, *Small Arms of the World*, p. 419.
36. For background, see M. Brzoska, "Other Countries," pp. 255-57.
37. Walter, *Rifles of the World*, pp.178-79.
38. Ezell, *Small Arms of the World*, p. 612.
39. *Ibid.*, pp. 613-14. See also *Jane's Infantry Weapons* 88-89, pp. 100-101, 302.
40. For background, see M. Brzoska, "Other Countries," pp. 268-70, 275.
41. See *Jane's Infantry Weapons* 95-96, pp. 99-100; Ronaldo Olive, "Peru's MGP-84 Mini," *International Defense Review*, April 1995, pp. 53-55.
42. See Table 13.5 in M. Brzoska, "Other Countries," pp. 271-74. On land mine production, see Arms Project, *Landmines*, p. 102 and Appendix 17.
43. Walter, *Rifles of the World*, p. 235.
44. Ezell, *et al.*, *International Small Arms Usage*, Pt. I, p. 115.
45. García-Peña, "Light Weapons and Internal Conflict in Colombia," p.104. See also "Military Plans Weapons Purchase," report on Santa Fe de Bogota Inravisión Television Cadena 1, June 5, 1994, as translated in FBIS-LAT-94-108, June 6, 1994, pp. 61-62.
46. Adrian J. English, "Guatemala—The Unending War," *Jane's Intelligence Review*, May 1993, p. 232.