

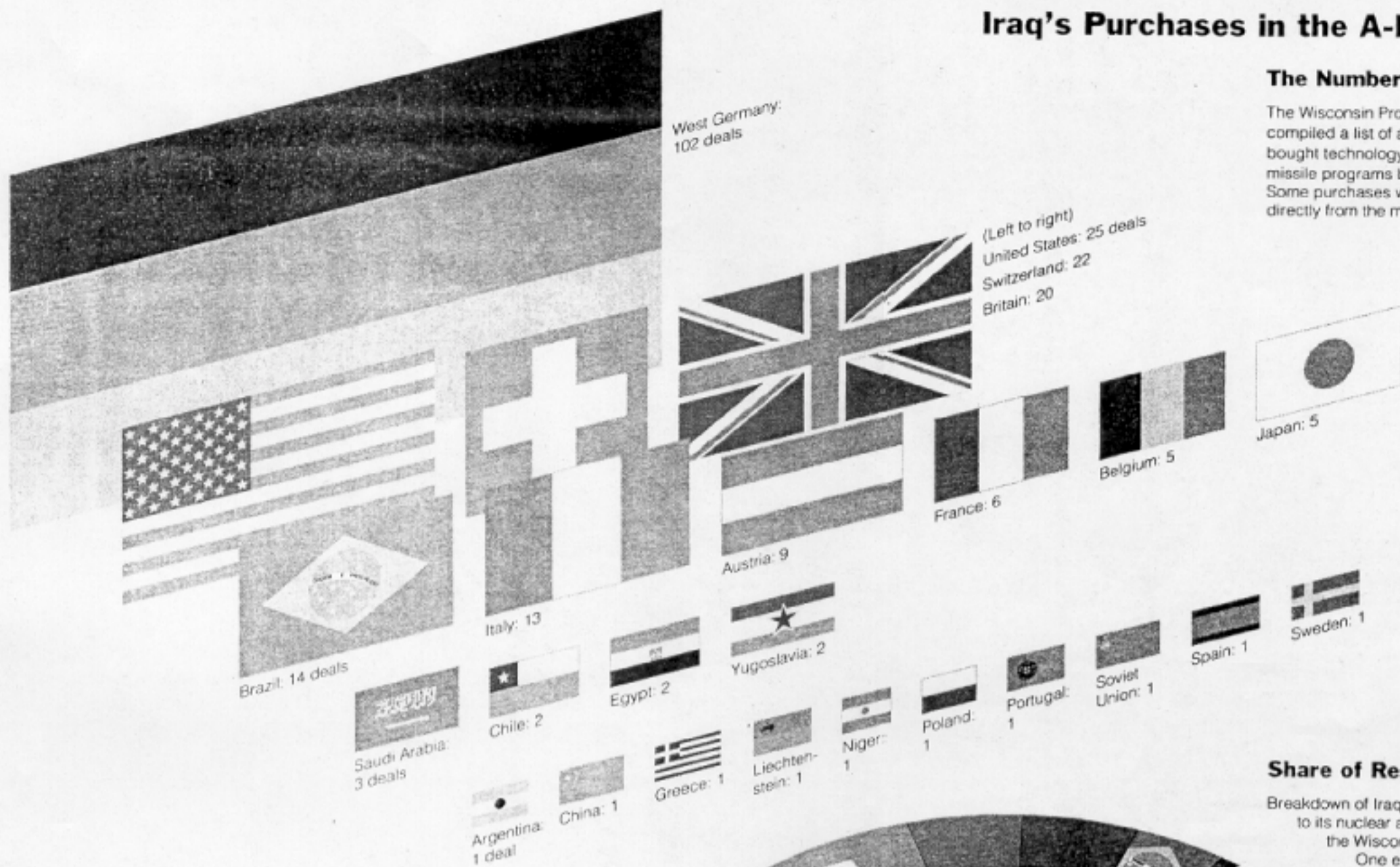
THE WEEK IN REVIEW

Iraq's Purchases in the A-Bomb Supermarket

The Number of Deals

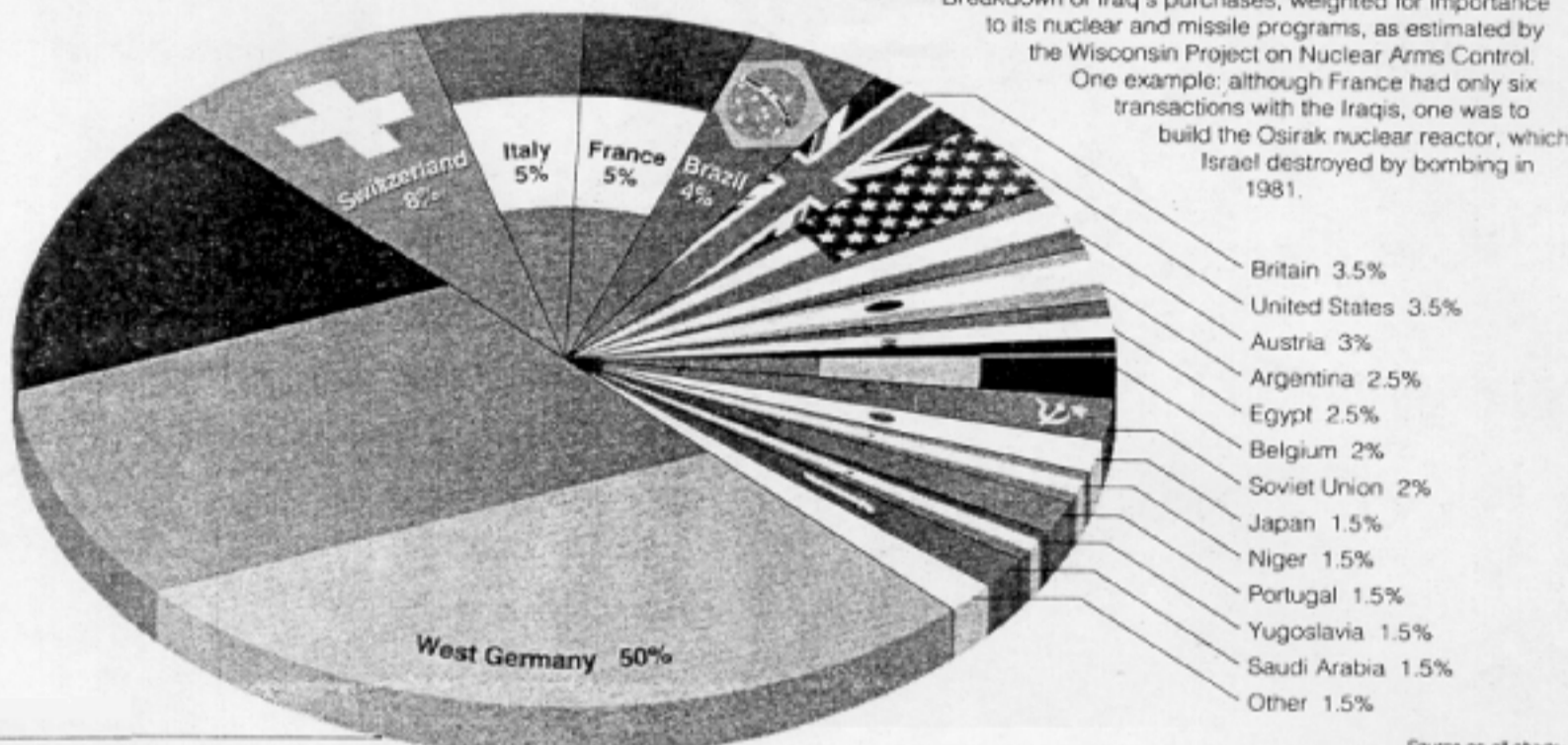
The Wisconsin Project on Nuclear Arms Control has compiled a list of all the publicly known deals in which Iraq bought technology and equipment for its nuclear and missile programs before the Persian Gulf war in 1991. Some purchases were made from brokers rather than directly from the manufacturer.

A deal can mean construction of an entire factory, or supplying the machine tools or training to operate it. The vast majority of these deals were approved by or made through governments.



Share of Responsibility

Breakdown of Iraq's purchases, weighted for importance to its nuclear and missile programs, as estimated by the Wisconsin Project on Nuclear Arms Control. One example: although France had only six transactions with the Iraqis, one was to build the Osirak nuclear reactor, which Israel destroyed by bombing in 1981.



Source on all charts: Gary Milhollin and Dana L. Edsward, Wisconsin Project on Nuclear Arms Control

Who Armed Iraq? Answers the West Didn't Want to Hear

By DOUGLAS JEHL

WASHINGTON
THE terms of the punishment forced on Iraq since the Persian Gulf War may be most valuable for what they have taught. Rarely has a country defeated in battle been so laid bare to outside scrutiny. To the victors, the answer to how Iraq gained its power is now dispiritingly clear: it was us — the West, and German companies in particular.

That conclusion is documented in stark detail in a new study by the Wisconsin Project on Nuclear Arms Control. Based in part on the work of United Nations inspectors, it identifies the Western companies who supplied the crucial parts in what was emerging as an extraordinary Iraqi arsenal. German firms were by far the worst offenders, but others in Switzerland, Britain, France, Italy and the United States were also instrumental. Without Western help, the report's author, Gary Milhollin, shows, Iraq could never have come so close to producing nuclear weapons and long-range missiles.

The pattern is in some ways familiar. Countries aspiring to power have long turned to foreign merchants for muskets and machine guns. What has changed has to do with what has changed about war. Rather than in vast shipments, even the smallest of acquisitions may prove decisive in an era in which nuclear, biological and chemical weapons can hold populations hostage. And the goods sought for military value may just as well be produced by a supercomputer manufacturer or biotechnology company as by a munitions maker.

A Western bolt found in an Iraqi missile is not necessarily a sign of complicity. A bolt has many peaceful uses, too. But the picture provided by the Wisconsin Project suggests just how instrumental such dual-use trade can be. Italian technology allowed Iraq to extract plutonium, and high-performance Swiss presses gave it the ability to make nuclear weapons parts. Most of what Iraq needed to extend the range of its Scud missiles came from Germany. American computers were used in virtually all Iraqi missile and nuclear sites.

Of course, Iraq's most crucial acquisitions had even clearer military purposes. The Soviet Union openly sold Baghdad hundreds of Scud missiles; Brazil helped secretly in an effort to build an atomic bomb. But it was the wider Western flood, aided by lax laws and porous borders, that helped Iraq to refine those tools, outfit secret factories, and thereby to reach the verge of even more destructive force.

'Dairy Plant' Parts

Just one example of that flow was first found in crates marked as dairy plant parts bound from Frankfurt to Baghdad. In fact the intercepted metal parts were a supplement to the 27,436 Scud missile parts worth \$28.2 million that the German company, H & H Metallform, had already delivered to Iraq. A separate compression device was to have helped Iraq test a new intermediate-range missile. There was little mystery to its purpose, German intelligence found: the company had sold the same kind of rocket-testing device to Brazil.

With the most dangerous of the projects dismantled, the tension between Iraq and the West is mostly about the future. In refusing again last week to permit U.N. inspectors to install cameras at a missile-test site, Iraq made clear its aversion to the next step of U.N. oversight, which under Security Council Resolution 715 calls upon the West to keep long-term watch as Iraq begins to build new weapons.

An apparent agreement on a separate U.N. plan calling for Iraq to sell oil to meet humanitarian needs suggested that Baghdad might still be open to a last-minute compromise. But even a fence-mending visit by Rolf Ekeus, the chief U.N. weapons inspector, left unclear by Friday whether Iraq would back down or brave a Western threat of a retaliatory strike.

The new U.N. focus on monitoring — with its fixation on products — nevertheless carries a danger of being too narrow. There are signs that Western equipment re-

Beefing Up the Scud Missile: Who Helped

The Soviet Union supplied Iraq with Scud missiles that had a range of 180 miles. They were used to bombard Israeli cities and a military base in Saudi Arabia where 29 American soldiers were killed after Saddam Hussein expanded the range to 380 miles. These companies and government agencies had roles:

- AUSTRIA**
AVL: Designed rocket test tunnel for missile complex.
Consultco: Designed missile complex.
Alfred Fenneberg: Managed construction of missile fuel complex.
- BRAZIL**
H.O. Piva; Embraer; Orbita: Trained Iraqis in rocket technology, supplied assistance.
- BRITAIN**
International Computer Systems: Supplied computers at missile site.
International Military Services: Designed and supervised construction of a missile testing complex.
Matrix Churchill: Supplied scores of sensitive machine tools.
MEED international: Front company for missile procurement.
Technology Development Group: Front company for missile procurement.
TMG Engineering: Front company for missile procurement.
- SAUDI ARABIA**
Saudi Pump Factory: Helped supply test stand for turbo pumps.
- SOVIET UNION**
Soviet Government: Supplied at least 819 Scuds.
- SWITZERLAND**
Condor Projekt: Supervised construction of missile fuel production site.
- UNITED STATES**
Electronics Associates: Supplied computer system for missile wind tunnel.
International Imaging Systems: Supplied imaging enhancing equipment capable of missile targeting.
Litton Industries: Financed West German firm Gildemeister, which built Iraq's missile complex.
Scientific Atlanta: Supplied antenna testers (through West German firms) for missile complex.
Tektronix: Supplied measuring equipment (through West German firm MBB) to missile site.
Wiltron: Supplied network analyzers used to develop missile guidance.
- WEST GERMANY**
Anlagen Bau Contor: Supplied laboratory equipment.
Aviatest: Built wind tunnels, supplied engineers for missile complex.
Beaujean: Developed and supplied test stands for missile propulsion.
BP; Carl Zeiss; Degussa; Tesa: Supplied training in missile electronics, wind tunnels, test facilities.
Fritz Werner: Subcontractor and supplier for missile complex.
Gildemeister: Contractor for missile complex, blueprints, machine tools, furnaces, test stands, control facilities.
H & H Metallform: Supplied rocketry equipment, cylindrical presses, testing plant for missile complex.
Havert Industrie: Supplied material, equipment, fast-refueling pressure units.
Heinrich Mueller: Supplied precision lathes.
Inwako: Intermediary for delivery of components to install gyroscopes.
Lalfeld: Supplied cylindrical presses, rocket motor nozzles.
Messerschmitt-Bölkow-Blöhm (MBB): Subcontractor for missile complex.
MBB and Gildemeister: Transferred American-made computers, electronic test equipment.
MBB and Transstechnica: Helped build radar tracking station, rocket test stand for missile complex.
Nickel: Supplied climate control technology for fuel stores at missile fuel production site.
Sauer Informatik: Supplied computer plant for missile complex.
Schoelmaier: Supplied electronic measurement and testing instruments for missile fuel production.
Siemens: Supplied switching devices, transformers, electrical systems to control missile fuel production, equipped radio room at missile complex.
Thyssen: Contract for 305 turbopumps (supplied 35).
Carl Zeiss: Supplied computerized mapping equipment.

Anne Cross/The New York Times

A Sampling of the Purchases

Types of technologies and equipment bought by Iraq from the five countries with the greatest share of responsibility.

WEST GERMANY	SWITZERLAND	ITALY	FRANCE	BRAZIL
Equipment to increase Scud range.	Missile development.	Missile development.	Missile development.	Scud improvement.
Scud launchers.	Nuclear weapons development.	Nuclear weapons development, notably plutonium extraction laboratories.	Nuclear weapons development, notably Osirak reactor.	Missile development.
Nuclear weapons development.	Supergun.	Supergun.		Nuclear weapons development.
Missile development.				
Warhead development.				
Supergun.				



Russia and China for nuclear reactors that could halve the time needed to produce a nuclear weapon. North Korea has devoted its recent shopping to expertise, coming within minutes last fall of luring a contingent of Russian nuclear scientists to Pyongyang. Libya has tried to buy rocket fuel from a Russian concern. India and Pakistan have been similarly energetic.

In the American-led efforts to curb such commerce, the recriminations of the gulf war still echo. Under pressure from Washington, Germany in particular has taken steps to tighten its once-flaccid export controls. Britain has begun an inquiry to review what led its companies to assist in the Iraqi buildup, including the manufacture by Sheffield Forge-masters of 52 six-meter-long barrels for Iraq's never-completed supergun. With the Iraqi lesson as a model, Congress last fall voted to subject Iran to export restrictions as rigid as those that are in effect on Baghdad.

Not even Iran has proven anywhere near as brazen as Iraq, however, making its quest harder to detect — and easier to minimize. In the absence of a recognizable villain like Saddam Hussein, a private company can find the temptation of big business abroad difficult to resist. "One major foreign order is enough incentive for some of these firms to turn a blind eye to the law," said Anthony Cordesman, a Middle East expert who has advocated even more rigid restrictions.

That problem is compounded when governments send mixed messages, as a lawyer for an Atlanta banker argued last week. The client, the local representative of the Banca Nazionale del Lavoro, is accused of granting nearly \$5 billion in unauthorized loans to finance Iraq's military buildup, and former President Bush was served with a subpoena after the lawyer said his testimony was

Saddam Hussein collected nuts and bolts and lethality for his Scuds from the nations that deplored him.

needed to demonstrate that the client was just carrying out unstated United States policy.

Even the Clinton Administration, having vowed to subject Iran and Iraq to a new "dual containment," has yet to reject an appeal by Boeing and General Electric for special permission to sell \$750 million worth of commercial aircraft and engines to Iran. Boeing has warned that a White House refusal to approve the sale would effectively surrender thousands of jobs to Europe's Airbus Industries.

Vague Pledges and New Pleadings

Still more powerful pressures affect Germany and Japan, who rely far more heavily on the Iranian market. So it was no surprise that President Clinton was able to win little more than a vague pledge from other leaders at the economic summit in Tokyo to hold Iran and other rogue countries accountable for their actions. As Mr. Milhollin warns, "Most of the companies that sold to Iraq are still in business, and are still looking for sales in the Middle East."

And for governments increasingly preoccupied with job creation, it may be difficult to reject new pleadings from those who insist that their chemical or computer can do no harm.

Any sale looks less sinister when considered individually; but the lesson of Iraq might counter such complacency. As chronicled now, it shows millions of dollars in British and German machine tools used to make centrifuges; sleek new Swiss presses designed to forge nuclear weapons parts; Mercedes-Benz tractors and flat-bed trailers fitted as mobile missile launching pads. Its message is that economic security, for all its importance, remains a subset of something more fundamental.

mains a key ingredient in secret weapons programs, not only in Iraq but elsewhere.

A report to Congress last month concluded that illegal shipments by Western companies had helped Iraq repair or rebuild nearly all of the military production capacity it lost during the war. American intelligence reports have similarly warned of newly aggressive efforts by Iran to acquire the technology needed to produce chemical and biological weapons. Iran has also ranged further afield, pressing both