

ARCHIVED REPORT

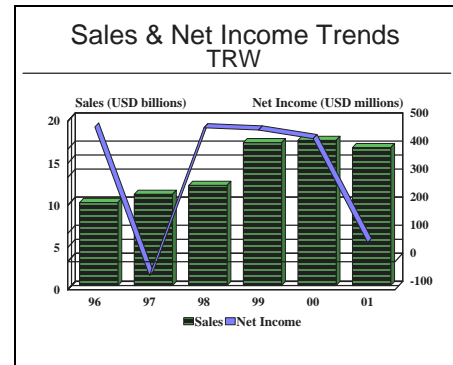
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TRW - Archived 7/2004

Outlook

- In mid-2002 Goodrich acquired TRW Aeronautical
- In late 2002 Northrop Grumman acquired the remainder of TRW including Automotive, Space & Electronics, and Systems
- With these acquisitions complete, TRW no longer exists as an aerospace and defense company
- This report will now be archived



Headquarters

TRW Inc
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Cleveland, OH 44124-3760
Telephone: (216) 291-7000
Web site: <http://www.trw.com>

Drs. Ramo and Woolridge founded Ramo-Woolridge in the 1950s to conduct advanced systems work for military applications. This company later merged with Thompson, an automotive products company founded in 1901. Headquartered in Cleveland, Ohio, Thompson, Ramo, Woolridge eventually become TRW Inc. Following a 25-year period of growth and diversification from 1960 to 1985, TRW Inc embarked on a restructuring program in 1985 to create a stronger, leaner company more focused in core business segments. The restructuring allowed each business to be a clear leader in its field and hold a position from which it would outperform the competition.

In 1986, several commercial electronics and energy-related businesses were divested. In 1987, additional commercial electronic businesses, as well as several marginal automotive units, were sold. In 1988, most of the company's remaining energy-related businesses

were divested. Thus, TRW Inc started 1989 as a company serving three industry segments: space and defense (the major focus for this report), the automotive industry, and the information systems industry. However, in 1991, due to poor financial performance, TRW embarked on another restructuring program to improve financial results. This restructuring program included divesting non-strategic and underperforming assets, including the Information Systems & Services business, which was sold in 1996.

In March 1999, TRW acquired LucasVarity of the UK in a deal valued at \$7 billion. The combination of TRW and LucasVarity created a global supplier of high-technology automotive and aerospace systems and services.

However, by the end of 2002, TRW was broken up as its major segments were divested. The first unit to go was TRW's Aeronautical Systems, which was acquired by Goodrich in June 2002 for \$1.5 billion in cash. The remainder of the company – Automotive and Space & Electronics – went to Northrop Grumman in July 2002, when its hostile takeover attempt succeeded in a \$7.8 billion deal.

Structure and Personnel

The following list is the company officials as of early 2002.

Philip A. Odeen

Non-executive Chairman
Wesley G. Bush
President and CEO, TRW Aeronautical Systems

Timothy W. Hannemann
 President and CEO, TRW Space & Electronics
 Howard V. Knicely
 Executive Vice President, Human Resources and
 Communications
 William B. Lawrence
 Executive Vice President, General Counsel and
 Secretary
 Steven Lunn

Executive Vice President, TRW Automotive
 John Plant
 President and CEO, TRW Automotive
 George C. Roman
 Executive Vice President, Washington Operations
 Robert H. Swan
 Executive Vice President and Chief Financial Officer
 Donald C. Winter
 President and CEO, TRW Systems

Product Area

TRW is a global corporation serving the space, defense, and automotive industries. Operations are believed to be grouped as follows:

1. Automotive Sector
 - 1.1 Chassis Systems
 - 1.2 Occupant Safety Systems
 - 1.3 Automotive Electronics
 - 1.4 Other Automotive
2. Aerospace & Information Systems
 - 2.1 Space & Electronics
 - 2.1.1 Civil & International Systems Division
 - 2.1.2 Defense Systems Division
 - 2.1.3 Electronics Systems/Technology Division
 - 2.1.4 Space & Technology Division
 - 2.1.5 Avionics Systems Division
 - 2.2 Systems
 - 2.2.1 Data Technologies Division
 - 2.2.2 Electromagnetic Systems Division
 - 2.2.3 Environmental Safety Systems Inc
 - 2.2.4 Global Change Initiatives Division
 - 2.2.5 Government Information Services
 - 2.2.6 Integrated Engineering Division
 - 2.2.7 Strategic Systems Division
 - 2.2.8 Systems Services Company
 - 2.3 Aeronautical Systems

Automotive. TRW designs, manufactures and sells a broad range of steering, suspension, engine, safety, engineered fastening, electrical, electronic, electro-mechanical, hydraulic, and other components and systems as original equipment for passenger cars, commercial vehicles, trucks, buses, farm machinery, and off-highway vehicles. *Acquired by Northrop Grumman, this unit was quickly divested to the Blackstone Group in early 2003.*

Aerospace & Information Systems. TRW's Aerospace & Information Systems group is composed of three key units:

Space & Electronics produces spacecraft systems, high-energy lasers, avionics, electro-optical and instrument systems, and telecommunications systems. *Now owned by Northrop Grumman.*

Systems provides systems engineering and integration; information technology solutions; and command, control, and communications systems. *Now owned by Northrop Grumman.*

Aeronautical Systems manufactures aircraft engine controls, flight controls, and cargo systems, and provides equipment services. *Now owned by Goodrich.*

Facilities

The following units are now part of Northrop Grumman:

Eastern Region

TRW Systems & Information Technology Group, 12011 Sunset Hills Road, Reston, VA 20190. Telephone: (703) 968-1000. This location is one of the headquarters for the group, which provides systems engineering and integration services. The group also develops and installs command and control systems information processing systems and security systems for US federal government agencies.

Western Region

TRW Space & Electronics Group, MS: E1/5061, One Space Park, Redondo Beach, CA 90278-1001. Telephone: (310) 812-4321. This unit, which is also

the group's headquarters, designs and develops spacecraft equipment and subsystems, ground control systems, environmental test facilities, launch operations, high-energy lasers and laser technology, and advanced payloads technology; and manages major space and ground subsystems and military space systems projects.

Electronics & Technology Division, One Space Park, Redondo Beach, CA 90278-1001. Telephone: (310) 814-4072. This division designs, develops, and manufactures spacecraft payloads and advanced communication systems.

Space & Technology Division, MS: R4/2090, One Space Park, Redondo Beach, CA 90278-1001. Telephone: (310) 812-4818. This operation is responsible for engineering design and development of

spacecraft equipment and subsystems. Products include electro-optical and electromagnetic sources and sensors, and combustion technology and propulsion systems.

Avionics Systems Division, MS: RC1/3039, One Rancho Carmel, San Diego, CA 92128. Telephone: (619) 592-3000. Products include high-technology integrated avionics systems.

Space & Laser Programs Division, One Space Park, Redondo Beach, CA 90278-1001. Telephone: (310)

813-6843. Manufactures major space projects for NASA and other civil space organizations. This unit also produces high-energy lasers and laser systems for various applications.

The following unit is now owned by Goodrich:

United Kingdom

TRW Aeronautical Systems, Lucas Aerospace, Stratford Road, Solihull B90 4LA, England. Telephone: (44 0121) 451 5999.

Corporate Overview

TRW was the nation's eighth largest defense contractor in FY02. Northrop Grumman acquired a majority of TRW in late 2002, transforming the company into the nation's second largest defense contractor. Grumman's targets were TRW's Space & Electronics unit, which makes defense satellites, communications equipment, and high-energy lasers; and the Systems unit, which deals in computer systems. Following the acquisition, Northrop Grumman sold TRW Automotive to a private investment firm, The Blackstone Group. Prior to this, in mid-2002, Goodrich purchased TRW's Aeronautical Systems unit, which specializes in flight controls, cargo systems, engine control systems, power and utility systems, and missile actuation.

New Products and Services

Liquid Booster Target. In April 2002, TRW was selected by the Missile Defense Agency to design a new liquid booster target under a \$29 million, five-year development contract. The new target-booster program will enhance the testing of current and future US missile defense systems.

SBIRS Low. In April 2002, TRW was named prime contractor of a combined team for the Department of Defense's missile tracking Space-Based Infrared System Low (SBIRS Low) program, under a new agreement reached with the DoD's Missile Defense Agency. (SBIRS Low is a critical enabler for the United States' missile defense system, providing end-to-end infrared tracking of missiles throughout their trajectories.) In the new team approach, TRW subcontractor Spectrum Astro will play a key role in developing spacecraft, while Raytheon and Northrop Grumman will develop sensor payloads under competitive subcontracts to TRW. Prior to restructuring, TRW, with Raytheon as a principal team member, and Spectrum Astro, with Northrop Grumman, led competing teams to define requirements and complete conceptual designs for an operational SBIRS Low system.

Plant Expansion/Organization Update

TRW Integration and Consolidation. In April 2003, Northrop Grumman created two new operating sectors from the TRW acquisition – Mission Systems and Space Technology. The policies and operating procedures of both sectors now comply with those of Northrop Grumman. These include a wide range of policies and procedures, including financial reporting, program oversight and risk management, human resources practices and access to the company's electronic network, among others. The Mission Systems and Space Technology sectors will continue to work closely with Northrop Grumman's five other operating sectors and corporate staff to identify and leverage company-wide capabilities. The new sectors are led by Don Winter, corporate vice president and president of Mission Systems, and Wes Bush, corporate vice president and president of Space Technology.

Mergers/Acquisitions/Divestitures

Northrop Divests TRW Automotive. In March 2003, Northrop Grumman completed the \$4.7 billion sale of TRW Automotive to affiliates of The Blackstone Group. The consideration included approximately \$3.9 billion in the form of cash and debt retained by TRW Automotive, a \$600 million payment-in-kind note, and a 19.6 percent equity investment in the new enterprise. Northrop Grumman said cash proceeds from the sale are expected to be used to pay down debt and to meet corporate obligations.

TRW Automotive, headquartered in Livonia, Michigan, is among the world's largest and most diversified suppliers of automotive systems, modules, and components, with annual sales of over \$10 billion. (Web site: <http://www.trwauto.com>)

TRW Acquisition Completed. In December 2002, Northrop Grumman completed the merger of TRW. TRW is now a wholly owned subsidiary of Northrop Grumman. Northrop Grumman's hostile pursuit of TRW finally succeeded in July 2002, with the company agreeing to pay \$7.8 billion. TRW had been resistant to Northrop's attempts – which began in February 2002 – because it believed that the initial offer of \$47 a share in

stock and its subsequent push to \$53 were inadequate. Northrop Grumman finally won the prize by offering \$60 a share in stock. TRW's previously announced agreement to sell its Aeronautical Systems business to Goodrich Corporation for \$1.5 billion was unaffected by Northrop Grumman's acquisition.

The combination has positioned Northrop Grumman as the nation's second largest defense contractor with projected annual revenues of more than \$26 billion and approximately 123,000 employees.

Goodrich Acquires Aeronautical Unit. In October 2002, Goodrich completed its acquisition of TRW's Aeronautical Systems businesses for \$1.5 billion in cash. The acquired businesses design and manufacture commercial and military aerospace systems and equipment with 6,200 employees located in 22 facilities throughout the world. The newly-acquired businesses have proprietary positions and technology and a large installed product base, which supports a strong aftermarket sales mix. In 2001, these businesses had sales of \$1.1 billion and EBITDA, before special items, of \$180 million as reported by TRW. This combination significantly enhances Goodrich's global position by adding several attractive new product platforms and broader manufacturing capabilities worldwide, with 65 percent of 2001 sales from services and products produced in Europe.

The Aeronautical Systems businesses will be reported as a separate reportable segment for the fourth quarter 2002, under the leadership of Jack Carmola, who also serves as Goodrich Group President, Electronic Systems. The Aeronautical Systems businesses are expected to be realigned and integrated into existing Goodrich reportable segments in 2003.

Diesel Systems Sold. In January 2000, TRW completed the sale of its Lucas Diesel Systems and associated aftermarket business to Delphi Automotive Systems. The transaction is valued at approximately \$875 million before tax. As previously announced, the sale of this non-core business was part of TRW's overall strategy, following the 1999 acquisition of LucasVarity, to reduce debt by \$2.5 billion by the end of 2000.

SAMM Acquired. In June 1999, Lucas Aerospace purchased French flight systems supplier SAMM, a subsidiary of the PSA Peugeot Citroen group, for an undisclosed amount. According to TRW, the acquisition is part of the company's strategy to double its turnover and improve its global ranking from a top-five player to a top-three player in a consolidating market. SAMM is a high-technology niche flight systems supplier serving Airbus Industrie, with a 1998 turnover of \$68 million and \$9 million operating profit.

TRW Sells Four Auto Units. In May 1999, TRW announced that it will divest the following automotive operations: the engine businesses, consisting of TRW Engine Components and Lucas Diesel Systems operations; TRW Nelson(R) Stud Welding; and the LucasVarity Wiring companies. Net proceeds from these divestitures, estimated to be \$1.2 billion to \$1.5 billion, will be applied to reduce debt incurred to finance the acquisition of LucasVarity. The company has established a goal of reducing its net debt during the next 18 months by approximately \$2.5 billion, including divestiture proceeds.

TRW Acquires LucasVarity. In January 1999, TRW and LucasVarity jointly announced that TRW will launch an all-cash tender offer to acquire all of the outstanding common shares of LucasVarity in a transaction that values LucasVarity at approximately \$7 billion. This was the largest cash acquisition in the history of the automotive supply industry. The offer, approximately \$47.35 per share, represented a premium of 41 percent over the closing share price of LucasVarity on December 31, 1998. The transaction closed in mid-1999.

With total revenues of nearly \$19 billion, the combined entity has become an industry leader in integrated vehicle control systems and modules, which include steering, suspension, anti-lock brakes, traction control, and active vehicle stability. In addition, the technological capabilities and customer base of TRW's space, defense, and information technology businesses have been enhanced with the addition of the LucasVarity aerospace business.

Astro Aerospace Acquired. In January 1999, TRW completed its acquisition of Spar's Astro Aerospace Corporation subsidiary in an all-cash transaction. Astro is now a wholly owned subsidiary of TRW's Space & Electronics Group. Based in Carpinteria, California, Astro has developed a number of lightweight mechanical systems used as solar arrays or reflectors on spacecraft.

Teaming/Competition/Joint Ventures

WIN-T. Strengthening its team in the pursuit of a multiyear, multibillion dollar tactical information network that will provide the next generation communications infrastructure for the US Army, TRW added Boeing to its team in March 2002.

The addition of Boeing complements TRW's existing team for the Warfighter Information Network-Tactical (WIN-T) contract, further building the industry strength needed to define the communications backbone for the Army's future Objective Force. Team members include ITT Industries, Qualcomm, Raytheon, SAIC, Agile, L3 Communications, Interactive Intelligence, and TEI, all

of whom have been working together with TRW for the past two years in addressing the complex challenges to be met by WIN-T.

As prime integration contractor for the WIN-T contract, TRW would be responsible for overall systems engineering and integration, particularly for network management and operations, ensuring that battlefield commanders have the tactical information they need when they need it. WIN-T, along with the Joint Tactical Radio System, will form the backbone of the Army's Objective Force in delivering video, voice, and data on demand for full battle command on the move.

Bowman. In November 2000, TRW and UK-based Raytheon Systems Limited teamed together under a \$12 million UK contract for risk-reduction work on the Bowman communications system. Also competing under separate contracts are teams led by Thales and Computing Devices Canada. ITT Industries is the supplier for the Bowman VHF radios regardless of the competition's winner.

ICBM Prime Integration Contract. In April 1997, TRW announced its teaming agreements with the Boeing Co, Thiokol Corp, and Lockheed Martin Command and Control Systems for the US Air Force Intercontinental Ballistic Missile (ICBM) prime integration contract. TRW intends to bid as prime contractor, with the three other companies as major subcontractors. The program will involve weapon system engineering and sustainment, including contracted repairs and technical order support, as well as system testing and responsibility for modification and replacement programs for both the Minuteman III and Peacekeeper weapon systems. The ICBM prime integrator contract, scheduled to begin in early 1998, will transition the current Air Force associate contractor relationship to a System Program Office (SPO) prime integrating contractor relationship. This change responds to the Secretary of the Air Force's Lightning Bolt acquisition initiative to improve efficiencies, reduce risk to the weapon system, and cut costs. This is the first time in its 42-year history that the ICBM weapon system contract will be managed in an SPO-prime integrating contractor relationship.

United Missile Defense Co. In April 1997, Lockheed Martin, Raytheon, and TRW announced the formation of a joint company to help build a comprehensive defense against ballistic-missile attack. The new venture, called United Missile Defense Co, will be headquartered in Crystal City, Virginia. In a joint release, the partners noted that each possessed unique experience in areas ranging from land- and sea-based missiles to strategic and tactical radar warning systems and battle management command and control. In April 1998, Boeing was selected over the United Missile Defense team by the Joint Program Office of the

Department of Defense's Ballistic Missile Defense Organization to act as lead system integrator for the National Missile Defense program.

Magnavox. In August 1995, a TRW/Magnavox team demonstrated a new secure digital datalink for the Battlefield Combat Identification System (BCIS), which allows weapons platforms to communicate data on the location of friendly units on the battlefield.

Israel Aircraft Industries. In June 1993, TRW and IAI signed an agreement aimed at meeting requirements for US military unmanned air vehicle (UAV) programs. The companies are teamed on the DoD's Short Range UAV project.

Hughes (Raytheon). In December 1992, the USAF awarded TRW a \$223.5 million demonstration/validation contract for the Brilliant Eyes space-based surveillance system. TRW teamed with Hughes Aircraft's Electro-Optical Systems Group. A similar contract was awarded to Rockwell International. However, in May 1995, the TRW/Hughes design prevailed over Rockwell's and was selected to proceed.

In addition, under a March 1995 agreement, Hughes and TRW teamed to pursue the USAF's Space-Based Infrared System (SBIRS), an early-warning satellite system. Hughes is leading this effort, with TRW handling system engineering and ground control.

Columbia. In January 1992, Honolulu-based Columbia Communications Corp and TRW Space & Technology Group announced a joint venture in which TRW was an anchor tenant for commercial capacity on one of NASA's tracking and data relay satellites (TDRS). The joint venture marked TRW's entry into the commercial satellite services industry. The company had plans to gain marketing experience toward its goal of building and operating its own hybrid C- and Ku-band satellite, to be called Pacificom 1.

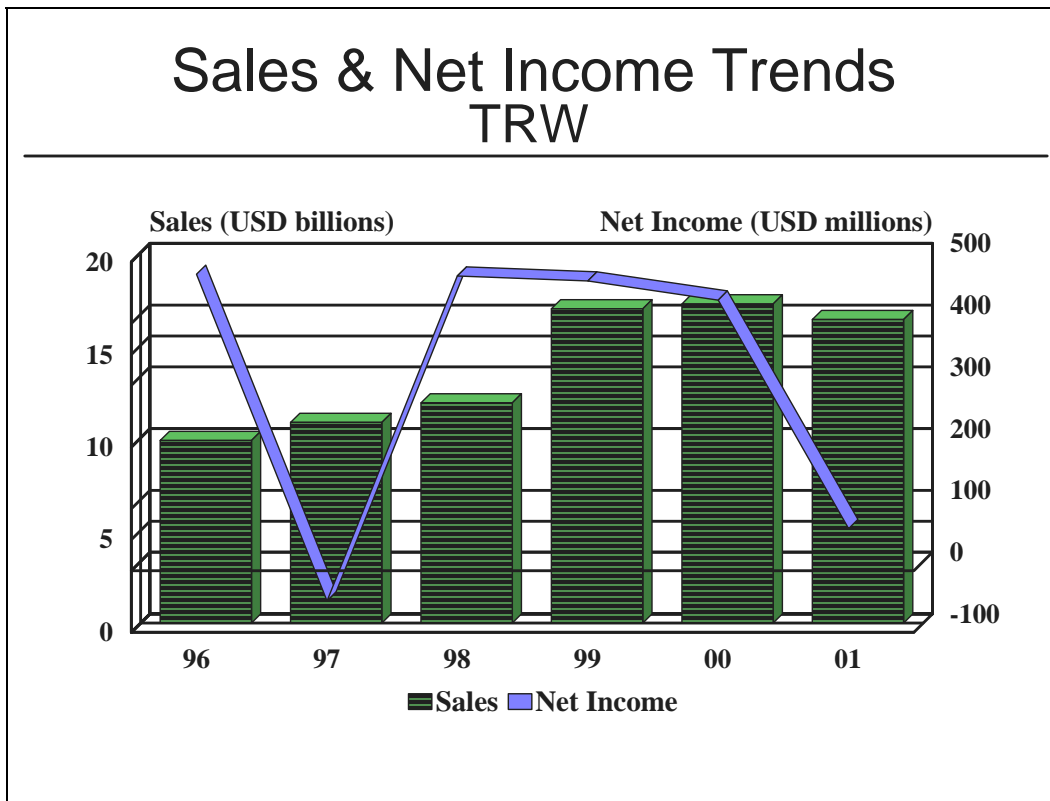
EFOG-M. In May 1994, Boeing, Lockheed Martin, and TRW teamed to compete for the Army Missile Command's Enhanced Fiber Optic Guided-Missile demonstration program. TRW Data Technologies is responsible for the battle management and C³I elements of the system.

Airborne Laser Program. In August 1993, Boeing, TRW, and Lockheed submitted a proposal to the US Air Force for the first phase of the Airborne Laser (ABL) Program, which entailed concept definition of an ABL system to destroy theater ballistic missiles in their boost phase. After a 21-month concept-definition phase, the Air Force was scheduled to downselect to one contractor for the demonstration/validation phase. A Rockwell/ Hughes/E-systems team was also in place to compete for an ABL contract.

Financial Results/Corporate Statistics

TRW's 2001 sales (the last year of reported financials) dropped to \$16.4 billion, compared with \$17.2 billion in 2000. Net earnings for the year fell to \$68 million, compared with \$438 million in 2000. Net income was impacted by restructuring costs of \$197 million during the year, as well as a write-off of \$222 million primarily in Astrolink International. The 1997 results include a \$548 million earnings charge related to in-process research and development associated with the acquisition of BDM. Latest year statistics are provided below. Please note that figures have not been restated to conform to the company's current presentation. R&D expenditures include both company- and customer-sponsored costs.

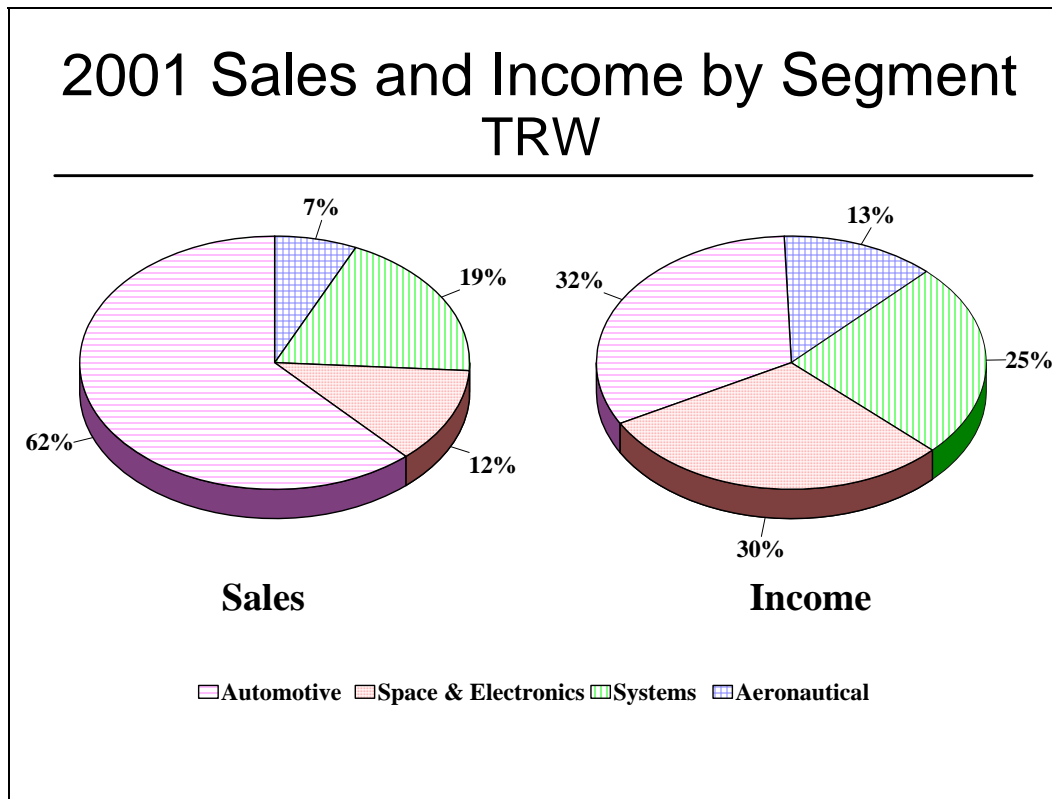
Y/E December 31	1996	1997	1998	1999	2000	2001
(USD millions)						
Net Sales	9,857	10,831	11,886	16,969	17,231	16,383
Percent Gov't	32	33	35	25	26	27
Net Income	480	-49	477	469	438	68
Backlog (Gov't)	4,631	5,469	5,119	5,200	5,600	7,600
R&D Expenditures	1,997	2,146	2,143	1,717	1,584	1,731



Industry Segments

A breakdown of the firm’s net sales and operating income by major business category for the past five years is given in the charts below.

SALES	1997	1998	1999	2000	2001
(USD millions)					
Automotive	7,032	7,201	11,328	10,994	10,111
Space & Electronics	2,005	1,922	1,870	1,880	2,020
Systems	1,794	2,763	2,869	3,252	3,150
Aeronautical Systems	-	-	902	1,105	1,102
TOTAL	10,831	11,886	16,969	17,231	16,383
OPERATING INCOME	1997	1998	1999	2000	2001
(USD millions)					
Automotive	637	543	715	508	228
Space & Electronics	204	266	500	459	212
Systems	144	192	86	209	176
Aeronautical Systems	-	-	123	152	90
TOTAL	985	1,001	1,424	1,328	706



Strategic Outlook

The acrimonious takeover of TRW officially ended in December 2002 with final approval of the deal. The \$13.3 billion acquisition is the culmination of Northrop Grumman’s 10-year odyssey to transform itself into an industry powerhouse. Thanks to its acquisition of

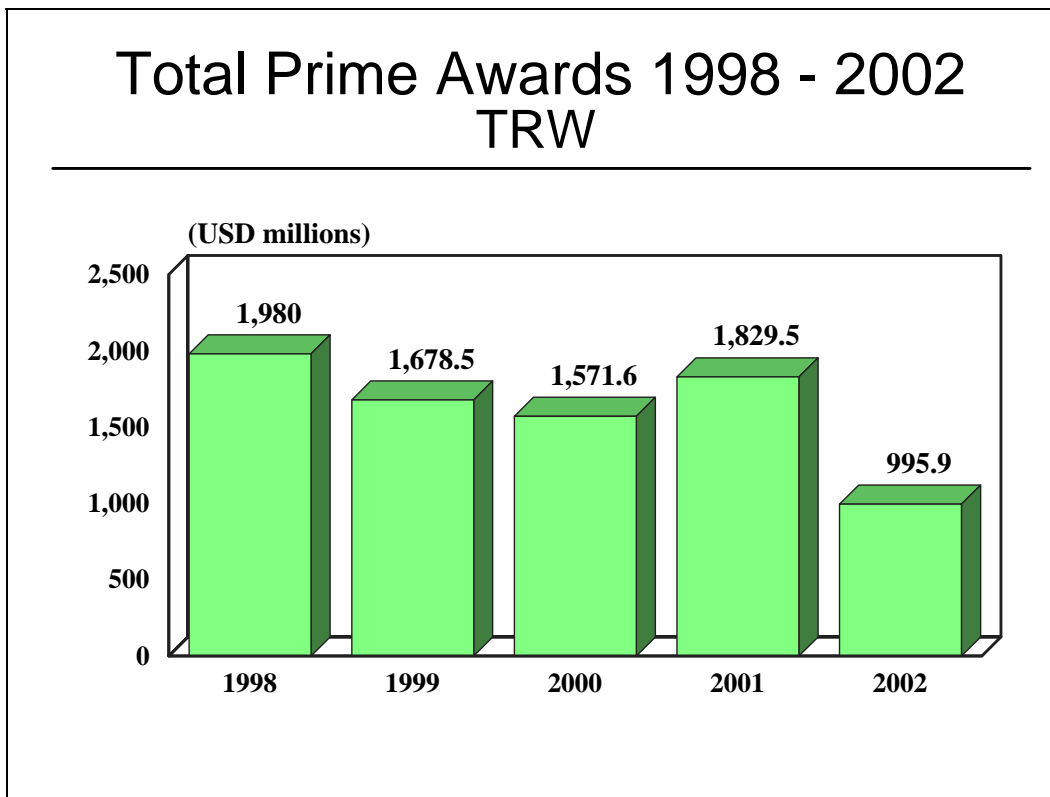
TRW, the company has firmly placed itself as the second largest defense contractor in the US.

Now that the sale is complete, this report will be archived.

Prime Award Summary

The following prime award tables show data for the past five fiscal years. Dollars are in millions. Zeros represent contracts of less than \$50,000, and dashes indicate data are not available.

TRW	1998	1999	2000	2001	2002
(USD millions)					
AIR FORCE	642.9	731.9	799.9	828.9	453.9
ARMY	268.0	276.6	230.4	550.9	305.2
ARMY CORPS OF ENGINEERS	2.8	3.0	0.0	1.6	0.7
DEFENSE AGENCIES	0.0	1.8	0.0	0.0	0.0
DEF COMM AGENCY	0.0	2.2	1.2	0.0	0.0
DEF LOGISTICS AGENCY	0.1	0.3	0.2	0.0	0.0
DEF MAPPING AGENCY	7.3	0.0	0.0	0.0	0.6
DEPT OF COMMERCE	41.6	12.9	5.3	0.0	0.0
DEPT OF ENERGY	439.4	240.0	213.7	87.3	2.5
DEPT OF JUSTICE	0.0	0.0	0.0	0.5	3.8
DEPT OF STATE	0.0	0.3	0.0	1.3	1.7
DEPT OF THE INTERIOR	19.5	12.0	10.0	13.9	18.3
DEPT OF TRANSPORT	94.6	18.4	4.6	1.1	2.7
DEPT OF TREASURY	210.0	175.5	152.7	150.3	80.1
FEMA	0.0	2.5	1.9	3.6	0.7
GENERAL SERVICES ADMIN	11.6	3.7	5.3	51.0	53.1
HEALTH & HUMAN SERV	2.6	70.2	74.6	63.9	7.3
NASA	0.0	0.0	0.0	0.0	29.8
NAVY	70.1	35.7	65.3	72.9	35.5
SEC	0.0	0.0	6.1	2.8	0.0
SDIO	169.6	91.5	0.4	0.0	0.0
TOTAL	1,980.0	1,678.5	1,571.6	1,829.5	995.9



The following tables are TRW prime awards broken down by company location within major geographical areas of the country.

EASTERN REGION

Fairfax, VA	1998	1999	2000	2001	2002
(USD millions)					
AIR FORCE	0.0	2.1	7.9	26.2	6.1
ARMY	19.8	22.1	14.8	85.3	79.8
DEFENSE AGENCIES	0.0	1.2	0.0	0.0	0.0
DEF COMM AGENCY	0.0	2.2	1.2	0.0	0.0
DEF MAPPING AGENCY	7.3	0.0	0.0	0.0	0.0
DEPT OF COMMERCE	41.6	12.7	5.3	0.0	0.0
DEPT OF ENERGY	439.4	240.0	212.5	85.9	1.5
DEPT OF STATE	0.0	0.3	0.0	0.0	0.0
DEPT OF TRANSPORT	73.1	5.1	0.0	0.0	2.7
DEPT OF TREASURY	210.0	137.0	152.1	145.6	71.0
FEMA	0.0	0.0	0.0	1.2	0.7
GENERAL SERVICES ADMIN	0.0	0.0	0.2	10.9	23.9
NAVY	47.5	0.7	12.0	4.8	3.2
TOTAL	838.7	423.4	406.0	359.9	188.9

WESTERN REGION

Redondo Beach, CA	1998	1999	2000	2001	2002
(USD millions)					
AIR FORCE	511.5	579.8	275.7	23.8	32.0
ARMY	98.0	53.0	20.4	50.6	16.7
DEPT OF THE INTERIOR	0.0	0.0	0.0	1.9	0.9
DEPT OF TRANSPORT	0.0	0.8	0.0	0.0	0.0
GENERAL SERVICES ADMIN	0.0	0.1	0.0	1.4	0.0
NASA	0.0	0.0	0.0	0.0	25.1
NAVY	3.5	4.1	5.1	2.7	2.4
SDIO	11.0	0.0	0.0	0.0	0.0
TOTAL	624.0	637.8	301.2	80.4	77.1

San Diego, CA	1998	1999	2000	2001	2002
(USD millions)					
AIR FORCE	27.8	15.7	8.5	13.8	5.7
ARMY	0.5	0.0	0.0	0.0	0.0
DEPT OF TRANSPORT	13.3	12.4	4.6	1.0	0.0
NAVY	4.2	9.3	7.6	18.6	0.8
TOTAL	45.8	37.4	20.7	33.4	6.5

Program Activity

Some important aerospace and government programs currently under way at TRW are listed below. The following is an outline of the company's business interests:

- Defense Electronics
- ASW
- C³I Systems

- Electronic Systems
- Electronic Warfare
- Sensors
- Missiles
- Space Systems
- Systems Integration
- Unmanned Vehicles

The programs detailed below are now owned by Northrop Grumman.

Electronic Programs

(Airborne Electronics)

GUARDRAIL/Common Sensor (USG-9)

Direction-finding, signals and communications intercept, signals intelligence (SIGINT) aircraft. The USQ-9(V) is the airborne system, and TSQ-176A the ground portion. GUARDRAIL is considered the “eyes of the deep battle” in US joint and coalition operations. System 2 is called GUARDRAIL 2000.

ICNIA

Most military aircraft have numerous individual communications, navigation, and identification (CNI) equipment that, when aggregated, are becoming size-, weight-, and cost-prohibitive. To solve this problem, the Air Force, Army, and Navy are jointly developing a technology called Integrated Communication, Navigation, Identification Avionics (ICNIA) to integrate these functions into one system. TRW is the ICNIA project leader. ICNIA’s primary application will be the F-22 ATF and RAH-66 Comanche.

(ASW)

Distributed Surveillance Systems

The Distributed Surveillance Systems effort, part of the US Navy’s overall Integrated Undersea Surveillance System (IUSS), funds development of deployable seabed-mounted hydrophones connected to shore-based monitoring stations for the detection of threat submarines. TRW is involved in projects X1312 and X1300 under this program.

Project X1312 Fixed Distribution System (FDS). FDS is a passive acoustic surveillance system using hydrophones to detect modern quiet submarines.

Project X1300 Advanced Deployable System (ADS). The ADS program provides for system study, prototyping, test, design, development, installation, recovery, and maintenance.

SOSUS

The primary mission of SOSUS (Sound Surveillance System) is to provide undersea global maritime surveillance in areas of interest to national security. The system consists of hydrophones in ocean floor-mounted cables connected to shore-based data processors. TRW handles engineering/integration services for SOSUS.

UYS-2(V)

The UYS-2(V) is an Enhanced Modular Signal Processor (EMSP). It provides increased performance capability for multiplatform ASW weapon systems, specifically the SQQ-89 Surface Ship Combat System, BSY-2 Submarine Combat System, Surveillance Towed Array Sensor System (SURTASS), and Airborne Low Frequency Sonar (ALFS).

(C³I)

ATCS

The Army Tactical Command and Control System (ATCCS) is a C³I system for the US Army. The objective of the ATCCS program is the procurement of common computer hardware and software for the five major segments of the US Army’s Sigma battlefield management concept: air defense, combat service support, fire support, intelligence/electronic warfare, and maneuver control. Although ACCS was the original name for the overall program, ATCCS is now being used by the Army, especially in reference to requirements below the corps level. When automated data processing for echelons above corps is added to ATCCS, it is apparently still called ACCS. The Marine Corps is implementing its own version, designated the MTCCS (Marine Corps Tactical Command and Control System), and is testing ATCCS components for possible application. TRW is the prime developer and integrator of the Common ATCCS Software Support. Lockheed Martin is the program’s prime contractor.

FAADS C²I

The Forward Area Air Defense System (FAADS) program will modernize the Army’s short-range air-defense capabilities. It is specifically aimed at countering low-altitude air threats over and beyond divisional areas of operation. The C²I portion will be a computerized system to automatically detect and identify aircraft entering Army division sectors and supply aircraft tracking and targeting data to FAAD battalions and their fire units. TRW is the prime contractor for systems integration on this program. The program is in full-scale production.

FBCB²

The Force XXI Battle Command Brigade and Below (FBCB²) is a digitized battle command information system. The FBCB² system provides on-the-move, near-real-time situational awareness and battle command information to tactical combat, combat support, and combat service support leaders and soldiers. The FBCB² system is an important component of the US Army Battle Command System (ABCS). The FBCB² program is in research and development, as well as low-rate initial production. TRW is the prime contractor.

Maneuver Control System

The Maneuver Control System (MCS) supports the US Army’s command and control operations on the battlefield. MCS is aimed at providing the US Army’s commanders with the data they need to manage their forces on the battlefield. TRW is the prime contractor for MCS systems engineering and integration.

NMD BM/C³ Element

The objective of the National Missile Defense (NMD) program is to develop an anti-ballistic missile (ABM) system that will protect the United States against ballistic-missile threats. The Battle Management/Command, Control, and Communications (BM/C³) element is the “brains” of the NMD system. In the event of a launch against the US, the Commander-in-Chief of the North America Aerospace Defense Command (NORAD) will control and operate the NMD system through the BM/C³. The BM/C³ provides the Commander-in-Chief with extensive decision support systems, battle management displays, and situational awareness information. In addition, the BM/C³ supplies the means to plan, select, and adjust missions and courses of action. TRW is the prime contractor for the NMD BM/C³.

SPADATS

The Space Detection and Tracking System (SPADATS) consists of two service elements: the Air Force SPACETRACK network and the Naval Space Surveillance System (NAVSPASUR). In peacetime, SPADATS provides the United States with crucial military intelligence on the characteristics and capabilities of Russian and other foreign space systems. In wartime, SPADATS was originally intended to be used to target former Soviet space assets for destruction via anti-satellite (ASAT) weapons and monitor the threat posed to US space assets from ex-Soviet ASATs. TRW is the ground-based electro-optical deep-space surveillance system (GEODSS) prime contractor under the SPADATS program.

(Electro Optics)

Airborne Laser (YAL-1A)

This is a development program for a prototype laser attack aircraft, the YAL-1A. Currently in Program Definition and Risk Reduction (PDRR), the program will produce an airborne laser weapon based on the boost phase intercept (BPI) concept for ballistic missile defense. Boeing, Lockheed Martin, and TRW are working on this system. TRW will provide the laser.

BCIS (VSX-3(V))

The Battlefield Combat Identification- System (BCIS) is a point-of-engagement, anti-fratricide system that will help distinguish between friendly and unfriendly vehicles on the battlefield. BCIS is a ground-to-ground, multifunction, all-weather, day/night, low probability of interception (LPI), low probability of detection (LPD), question-and-answer system that provides positive identification of friendly targets. BCIS was designed to

minimize fratricide while maximizing combat effectiveness under rapidly changing and intense tactical scenarios. TRW and Raytheon are working on this system.

High Energy Laser Systems Test Facility

Operating out of the White Sands Missile Range in New Mexico, the High Energy Laser Systems Test Facility (HELSTF) is the US Army Space and Missile Defense Command's support facility for research, development, testing, and evaluation of high-energy-powered lasers for use on missiles, aircraft, drones, and targets. Work at the facility consists of the definition of test requirements, the physical setup of lasers and optics, target setup, instrumentation, data collection and reduction, and site preparation. TRW is working on the Tactical High Energy Laser advanced concept technology demonstrator.

Space-Based Laser

This is a space-based high-energy laser, ballistic missile defense system. The Space Based Laser (SBL) program, as it exists today, is one of the few remaining elements of the larger-scale Strategic Defense Initiative (SDI). In 1999, the following contractors agreed to combine their efforts in SBL development by forming the joint venture Team-SBL-IFX: Boeing, Lockheed Martin, and TRW. (For more information, see **Space System Programs**.)

Tactical High Energy Laser

This is a point-defense weapon system for destruction of short-range artillery rockets. The system will be initially deployed in up to eight semimobile trailers. Future systems might be deployed on a 5-ton truck, the chassis of an M2 Bradley infantry fighting vehicle, or other similar platforms. The Tactical High Energy Laser (THEL) prototype uses a laser called the MIRACL (Mid-Infrared Advanced Chemical Laser). This is a megawatt-class continuous-wave deuterium fluoride chemical laser built by TRW.

(Electronic Systems)

Joint National Test Facility

The Joint National Test Facility (JNTF), formerly known as the National Test Bed (NTB)/National Test Facility (NTF), provides a comprehensive simulation environment capability to support ballistic-missile defense design, development, and follow-on operational test and evaluation. It also provides the US Space Command, the individual service space commands, and the various theater commanders-in-chief with real-time simulations to explore ballistic-missile defense operational concepts, concept of operations, and orders of battle. TRW is working on R&D for the NTF.

Joint Simulation System

The Joint Simulation System (JSIMS) is a US Department of Defense (DoD) interoperable training simulation system capable of combining warfighting doctrine; command, control, communications, computer, and intelligence (C⁴I); and logistics for full-spectrum joint warfare. TRW is the prime contractor for development and the Common Core Engine.

Missile Programs

AGM-109/BGM-109 Tomahawk

The Tomahawk is a multipurpose, multi-launch-platform, conventional/nuclear cruise missile. The surface- and sea-launched versions have a Mk 106 solid-propellant booster rocket manufactured by Atlantic Research Corporation/TRW.

AGM-114A/B HELLFIRE

This is a modular laser-guided anti-tank/anti-ship missile system. TRW and Gamma (a joint venture of Lockheed Martin and Alpha Industries) are cooperating in providing the HOMS (HELLFIRE Optimization program) seeker's transceiver.

LGM-30F/LGM-30G Minuteman

The Minuteman is a three-stage, solid-propellant, inter-continental ballistic missile. TRW was a major subcontractor on the program. The US selected TRW as its civilian prime contractor under the ICBM Prime Integration contract in December 1997. TRW is allied with Lockheed Martin, United Technologies Chemical Systems Division, Boeing, Thiokol, MRJ Technology Solutions, and BDM International.

Space System Programs

Cassini

Cassini is a science spacecraft developed to explore Saturn and its moon Titan. TRW built the electronic data recorders for the spacecraft. The Cassini spacecraft was launched in October 1997. Following a six-and-a-half-year voyage, the spacecraft will orbit Saturn for four years beginning in June 2004.

Chandra X-ray Observatory/Constellation-X

The Chandra X-ray Observatory (formerly called the Advanced X-ray Astrophysics Facility) is a long-duration, scientific telescope platform. Constellation-X is a follow-on to the Chandra X-ray Observatory program. The Chandra Observatory will study X-ray emissions to obtain details about black holes, quasars, spinning neutron stars, globular clusters, galaxies, supernovas, stellar coronas, dark matter, and galaxy clusters. TRW produced the spacecraft for this program. The Chandra X-ray Observatory was

launched aboard the Space Shuttle Columbia in July 1999. The Constellation X-ray Mission is currently in a pre-Phase A study. If developed, Constellation-X spacecraft would be launched in the latter part of the decade.

Defense Support Program

The Defense Support Program develops and deploys satellites designed primarily to provide early warning of a ballistic-missile attack. The satellites are also used to monitor Russian and Chinese missile launchings. TRW is the prime contractor. The Space-Based Infrared System (SBIRS) was scheduled to replace DSP satellites after 2000.

Eagle S-Series

Eagle satellites are small, relatively inexpensive spacecraft used for a number of applications in low-Earth orbit. TRW Space & Electronics Group is the prime contractor for Eagle Class satellites.

EOS

The Earth Observing System (EOS) is a series of scientific spacecraft that forms part of the United States Mission to Planet Earth program. TRW is the instrument source for Clouds and Earth's Radiant Energy System (CERES). CERES will provide a cloud and radiation database. NASA plans to fly CERES instruments on board two EOS satellites, as well as other science spacecraft such as TRMM and POEM-1.

In September 1995, TRW received a \$399 million contract from NASA to build two EOS-common spacecraft, the Aqua and the Aura (formerly PM-1 and Chemistry, respectively). The satellites are intended to gather data on climate as part of NASA's Mission to Planet Earth environmental initiative.

NGST

The Next Generation Space Telescope (NGST) is a follow-on to the Hubble Space Telescope. TRW's Space & Electronics Group and Ball Aerospace & Technologies Corp are teamed for Phase I architecture studies. A team led by Lockheed Martin Missiles & Space is also working on Phase I studies. Team members include Raytheon, Honeywell, and Jackson and Tull. NASA awarded Phase I architecture studies in July 1999. The NGST spacecraft is slated for launch in 2009.

MILSTAR

MILSTAR is a joint-service, advanced satellite-based military communications (EHF/SHF/UHF) system. The program is currently in full-scale engineering development/initial production. TRW is working on the payload subsystems of the satellites. Final launch for Milstar II series is slated for 2002.

SBIRS Low

The Space Based Infrared System (SBIRS) is a satellite system to replace Defense Support Program (DSP) satellites. SBIRS-Low satellites are low-Earth orbiting spacecraft that will use passive sensors to detect and track objects (primarily hostile nuclear warheads), discriminate hostile re-entry vehicles from decoys, and provide targeting information to ground-based interceptors. (See **New Products and Services** for program update.)

Space-Based Laser

The Space-Based Laser (SBL) is a low-Earth-orbiting (LEO) weapon system to provide boost-phase ballistic missile defense. Team SBL IFX Joint Venture, Canoga Park, California, is providing the first increment of the SBL program’s Integrated Flight Experiment project. Team members include Boeing, Lockheed Missiles & Space, and TRW Space & Electronics Group. An on-orbit laser experiment, using technology derived from the SBL Integrated Flight Experiment, is expected to be conducted in 2010. An operational system is not expected to follow until years later.

STP

The Space Test Program (STP) provides testbeds for DoD space experiments. STP provides space flight missions for conducting feasibility demonstrations of advanced concepts in the space environment. The program centralizes the management of spacecraft procurement, payload integration, launch scheduling, and services. TRW is one of numerous contractors involved in this effort.

TDRS

The Tracking and Data Relay Satellite (TDRS) is a geosynchronous, high data rate communications satellite. The Space Network consists of the TDRS satellites and a number of NASA ground elements to provide the necessary services to low-Earth-orbiting spacecraft, including the Space Shuttle. TRW is responsible for satellite design, development, and production. Ten satellites have been produced (TDRS-A through J).

UHF Follow-On

The UHF Follow-On (UFO) satellites are Ultra-High-Frequency (UHF) and Extremely High-Frequency (EHF) communications spacecraft for Department of Defense tactical and strategic applications worldwide. TRW is producing the dual-channel processors for these satellites.

Unmanned Vehicle Programs

Hunter

Hunter is a multimission unmanned air-vehicle system designed for short-range battlefield reconnaissance/surveillance, target designation missions. It can also be used for civilian applications. The system is being marketed by Israel Aircraft Industries (IAI). TRW Avionics Division is teamed with IAI and will provide system integration and software development. TRW established a plant in Sierra Vista, Arizona, to perform this work. The B-Hunter variant was selected to meet the Belgian Epervier requirement in 1998. The first B-Hunter air vehicles were to be delivered to Belgium in 2000. The contract will take six years to complete.

US Contract Awards

Below is a listing of major contracts awarded to TRW from the United States government in the past two years (contracts as of press date).

<u>Date</u> 1999	<u>Award</u> <u>(USD millions)</u>	<u>Contract #</u>	<u>Description</u>
1/29/99	46.9	F05604-95-D-9001	O&M, support services, engineering services, and management programs.
2/1/99	5.3	DASW01-99-D-0013	Provide quick turnaround analytic support for the Army Research Institute.
2/19/99	10.5	F04701-99-C-0040	Discoverer II Space-Based Radar technology demonstration program.
3/1/99	12.6	F42610-95-C-0043	Engineering services through 9/99 in support of Air Force Space & Missile Systems Center.
3/16/99	11.5	SDIO84-92-C-0002	Testing of the alpha hydrogen fluoride laser in support of the Space Based Laser project.
3/23/99	50.1	F42610-98-C-0001	Communication network in support of the Minuteman missile system.
3/30/99	9.6	DAAH01-99-C-A002	Technical support and systems engineering services for US Army Aviation & Missile Command.

<u>Date</u>	<u>Award (USD millions)</u>	<u>Contract #</u>	<u>Description</u>
5/28/99	10.3	DABT63-99-C-0021	Agile Information Controlled Environment (AICE) technology components.
6/11/99	7.8	SDIO84-92-C-0002	Development of an uncooled resonator in support of the Space Based Laser program.
6/22/99	6.4	F33615-99-2-5505	Flexible space vehicle production line program.
6/30/99	24.5	DAJA22-99-C-0088	Non-personal services for the provision of translation services.
7/1/99	17.9	HQ0006-95-C-0018	Development of the 2003 Theater Ballistic Missile Defense Family of Systems requirements document.
8/9/99	323.9	?	Distributed Mission Trainer operations and integration program.
8/17/99	275.0	F04701-99-C-0047	Program definition of the Space Based Infrared System (SBIRS) Low component.
9/16/99	9.0	DAAH01-99-C-0003	Deployment of Hunter UAV system repairs and spare parts.
9/30/99	112.5	F42610-98-C-0001	FY00 continuous engineering services and tech assistance for Minuteman and Peacekeeper.
9/30/99	35.2	F42610-95-C-0043	FY00 continuous engineering services and tech assistance for Space & Missile Systems Center.
9/30/99	7.9	F42610-98-C-0001	Expand FY00 engineering and technical service in support of Minuteman and Peacekeeper.
9/30/99	14.5	F42610-98-C-0001	FY00 re-entry vehicle application program.
9/30/99	6.8	F42610-98-C-0001	FY00 guidance backshop support for Minuteman and Peacekeeper.
9/30/99	76.1	F42610-98-C-0001	LRIP for Stages I-III and guidance replacement for the Minuteman.
10/1/99	41.6	F04701-96-C-0030	FY00 spacecraft constellation support, spacecraft operations, and maintenance for Defense Support Program satellites.
10/29/99	17.7	DAAH01-99-C-0003	Contractor logistic support and depot maintenance activity.
11/22/99	6.9	F33657-97-C-4505	Development of upgraded configurations for Joint Signal Intelligence Avionics Program.
12/13/99	20.6	F04701-00-C-0500	Risk reduction task for the National Polar Orbiting Operational Environmental Satellite System (NPOESS).
12/17/99	137.3	F42610-98-C-0001	60 NS-50 missile guidance sets for Minuteman III.
2000			
1/5/00	28.9	F42610-98-C-0001	Engineering services through 9/03 in support of the propulsion-system rocket-engine life extension for Minuteman.
1/18/00	156.0	F05604-95-D-9001	O&M and support services, engineering services and management programs.
1/27/00	41.0	DAAB07-00-D-E604	Force XXI Battle Command Brigade and Below systems.
3/2/00	5.1	F19628-00-C-0018	EMD of charge coupled device camera.
3/9/00	19.3	F42610-98-C-0001	Replacement battery systems for the Minuteman ICBM.
4/7/00	7.5	F09603-00-D-0072	Engineering services through 4/05 for the ALR-62 radar warning receiver on the F-111 aircraft.
4/17/00	284.7	F33657-98-D-2061	Distributed mission training operations and integration program through April 16, 2005.
5/31/00	6.9	DAAH01-00-C-0003	Hunter UAV payload hardware and software mod kits.
6/13/00	7.3	DAAB07-00-C-J005	Battlefield Combat Identification System (BCIS).

<u>Date</u>	<u>Award (USD millions)</u>	<u>Contract #</u>	<u>Description</u>
6/22/00	5.6	MDA972-00-C-0016	Development of a modular, integrated optic-based RF lightwave circuit.
8/11/00	6.9	N00383-00-C-003D	1,306 power transmissions shafts for the F/A-18C/D aircraft.
9/28/00	17.2	F42610-98-C-0001	FY01 system engineering support for Air Force Space Command.
9/28/00	42.7	F04701-96-C-0030	FY01 spacecraft constellation in support of the Defense Satellite Program satellite system.
9/29/00	22.5	?	Aerospace Sensor Component and Subsystem Investigation and Innovation I.
9/29/00	16.5	F42610-98-C-0001	FY01 ICBM re-entry vehicle applications program.
9/29/00	14.1	F42610-98-C-0001	FY01 ICBM guidance applications program.
10/2/00	119.5	F42610-98-C-0001	LRIP for the propulsion replacement program for Stages I-III of the Minuteman.
10/11/00	16.0	MDA904-96-C-0035	Engineering support.
11/15/00	171.2	F42610-98-C-0001	80 NS-50 missile guidance sets for the Minuteman III.
12/6/00	5.6	F42610-98-C-0001	Three missile guidance set controls for the Minuteman III.
12/15/00	6.9	DAHH01-00-C-0029	Initial Brigade Combat Team Tactical Operations Centers for the 1st and 2nd Brigades.
12/29/00	78.3	F04701-00-D-0203	Technical assistance of the rocket system launch program.
2001			
1/31/01	25.6	F04701-00-C-0500	Risk reduction on the NPOESS.
2/28/01	6.9	F42610-98-C-0001	EMD for Minuteman MEECN.
3/2/01	44.9	F33657-97-C-4505	Version of the Joint Signal Intelligence avionics family high band subsystem.
5/18/01	50.0	DAAE30-01-D-1003	Electronic system tech support for the M109A6.
6/1/01	45.0	DAAB07-01-D-E502	Force XXI situational awareness and command and control information.
6/12/01	5.6	DASG60-96-C-0155	Mobile tactical high energy laser.
7/3/02	004	M67854-98-C-2164	Joint Service light nuclear, biological and chemical reconnaissance system.
7/19/01	13.0	DAAB07-01-D-L860	Fielding of a Guardrail Information Node.
8/3/01	8.6	N00014-01-2-0014	Demo HF and low consumer power operation of integrated circuits based on the antimonide-based compound semiconductor material.
9/7/01	17.8	N00383-01-C-008F	43 Group II mission computer replacements for the E-2C aircraft.
9/19/01	11.5	N00140-01-C-1195	Services to support the US Joint Forces Command Joint Warfighting Center.
9/19/01	139.0	F42610-98-C-0001	FY02 sustainment of Minuteman and Peacekeeper.
9/25/02	42.2	F04701-96-C-0030	FY02 post production support for the Defense Support Program Satellite System.
9/27/01	17.7	F42610-98-C-0001	FY02 engineering support for headquarters Air Force Space Command.
9/28/01	46.2	DAJA22-99-C-0088	Translation services in support of US peacekeeping mission in the Balkans.
9/28/01	42.2	F04701-96-C-0030	FY02 post production support for the Defense Support Program Satellite System.
10/1/01	215.0	F42610-98-C-0001	Production of the propulsion replacement program for stages I-III of the Minuteman ICBM.
10/1/01	42.2	F04701-96-C-0030	FY02 post production support for the Defense Support Program Satellite System.

<u>Date</u>	<u>Award (USD millions)</u>	<u>Contract #</u>	<u>Description</u>
10/16/01	10.5	DASW01-02-C-0006	Support the Office of the Director of Operational Test and Evaluation.
10/24/02	180.9	F42610-98-C-0001	FY02 production of guidance replacement program for Minuteman III.
10/30/01	22.3	DAAH01-02-C-0009	FY02/FY03 logistics support for the Hunter UAV system.
11/1/01	27.4	DAKF04-02-C-0001	Logistic support services which include operating the Central Issue Facility.
11/28/01	5.1	F04701-96-C-0030	FY02 post production support for the Defense Support Program satellite system.

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