BGT Bodenseewerk Gerätetechnik Gmbh - Archived 10/96

Headquarters

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BGT Bodenseewerk Gerätetechnik GmbH is a limited liability company, and is therefore unlisted in any public stock exchange. The firm, located in the extreme southwestern portion of Germany, employs approximately 1,500 persons.

BGT is a leading German firm specializing in optical technologies, electronics and precision machinery. BGT, originally called Bodenseewerk, was formed as an independent company in 1946, from the aeronautical division of Askania Werke Berlin. Eight years later, Perkin Elmer Corporation of the US acquired a majority shareholding in Bodenseewerk.

BGT was established in its current form in 1960, in order to accommodate the requirements for European AIM-9 Sidewinder air-to-air missile production. In 1989, Diehl GmbH & Co purchased BGT from Perkin-Elmer, and shortly thereafter, Matra SA (Groupe Matra) of France acquired a 20-percent share in BGT. With facilities in Überlingen, Markdorf, and Toulouse, BGT boasts a total production area of 45,000 square meters and a work force of 1,350 persons. The Diehl Group is the majority shareholder in BGT while Matra of France is a minority shareholder.

Structure And Personnel

Hans-Peter Reerink — Managing Director

President & CEO

Dr. Manfred Putz

Rainer Ott — Public Relations

Product Area

BGT Bodenseewerk Gerätetechnik GmbH is one of Germany's leading manufacturers of missiles and guidance systems. In addition, BGT develops and manufactures guided munitions for anti-tank and anti-

air defense, flight control systems for Airbus transport aircraft, engine control systems, electro-optical systems, measuring equipment, subsystems for guidance and limiting, and inertial reference/guidance systems. BGT Bodenseewerk Gerätetechnik is structured in three main divisions:

1. Intelligent Systems

2. Control and Navigation

2.1 Commercial Systems

2.2 Defense Systems

3. Automation and Medical Technology

Intelligent Systems. This division is mainly concerned with the development and production of guided missile systems, guided projectiles and the related guidance and control systems.

Control and Navigation. The Control and Navigation division is engaged in the fields of flight guidance and control, engine control, and navigation. The division is structured into two product groups, Commercial and Defense, each with its own product responsibility.

Automation and Medical Technology. The objective of this division, according to BGT, is to convert the most recent findings in the fields of microelectronics, high-performance image processing, sensor technology, and systems simulation into products and customized systems

for use in robotics, medical systems and environmental monitoring.

Facilities

BGT management, design, development and manufacturing activities are all undertaken at the headquarters of the company, located in Überlingen, Baden-Württemburg, which lies next to the Bodensee (Lake Constance).

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Ulrich-von-Hassell-Strasse 64, D-53121 Bonn, Germany.

Ferdinand-Sauerbruch-Strasse 27, D-56073 Kloblenz, Germany.

Corporate Overview

BGT Bodenseewerk Gerätetechnik GmbH is a subsidiary company in the Diehl GmbH & Co group. BGT is currently organized into three main product divisions: the Intelligent Systems Division, which develops and manufactures guided weapons, seekers, and missile components; the Control and Navigation Division, which is involved in the production of systems for air and land applications; and the Automation and Medical Technology Division, which is being used by BGT as a diversification vehicle and a means to bring BGT high technology to nonmilitary applications.

New Products And Services

ASRAAM. With the collapse of the original AIM-132 ASRAAM effort, the United Kingdom embarked on a new competition. This new program would have as its aim the securing of a contractor for the development of an advanced short-range air-to-air missile (ASRAAM) specifically for UK military requirements. The competitive teams include ones led by British Aerospace Dynamics (with Hughes), BGT of Germany, and GEC-Marconi (with Matra). Under the new British Aerospace Dynamics proposal offered to the UK Ministry of Defence, Hughes would take responsibility for a percentage of the electronics work on the missile (primarily the seeker) and supervise the flight test program. The missile would be based largely on the original AIM-132 ASRAAM concept. GEC-Marconi Defence Systems and Matra offered an alternative system known as MICASRAAM, basically a MICA missile with a Marconi seeker. Meanwhile, Bodenseewerk Gerätetechnik of Germany submitted a system based on the AIM-9 Sidewinder with a new seeker and upgraded electronics. In early 1992, the British Aerospace Dynamics ASRAAM was selected as the winning entry. Development is getting under way and a tentative in-service date of 1998-1999 has been announced.

SMAT/SMASH. The SMAT/SMASH, an experimental submunitions family, is under study by BGT, with the sponsorship of the Bundesminesterium für Verteidigung (BMVg). The SMAT/SMASH will be launched either from a container or a standoff weapon (such as the Matra Apache). The SMAT is a infrared-guided anti-vehicle submunition, while the SMASH is intended for attack against hardened aircraft shelters.

Plant Expansion/Modernization/ Organization Update

No new plant expansion, modernization, or organizational changes have been recently announced.

Mergers/Acquisitions/Divestitures

No recent mergers, acquisitions, or divestitures have recently been announced by BGT.

Royal Ordnance plc Explosives Division R&D Center, SAT, SAGEM, SERAT, SFENA, SFIM, SNPE, Thomson-CSF and Thorn EMI.

Teaming/Competition/Joint Ventures

TGZ (TRT, GEC and Carl Zeiss). The TRIGAT/PARS-3 anti-tank missile major subcontractors include the TGZ consortium (TRT, GEC Avionics and Zeiss, tasked with work on the guidance system), as well as Bodenseewerk Gerätetechnik GmbH (BGT), Telefunken Systemtechnik, Air-Log, Bayern Chemie, Eltro, Elektro Speziale (Philips GmbH), Ferranti Industrial Electronics, Giravions Dorand, HYMATIC, Krauss-Maffei, Marconi Command and Control Systems Ltd, MSA, Mullard, RARDE,

GEC Avionics. BGT Bodenseewerk Gerätetechnik is involved in a consortium led by GEC Avionics, for the purpose of development and production of the Flight Control Computer, based on the Ada software language, for the Eurofighter Jagdflugzueg GmbH European Fighter Aircraft EFA/Jagdflugzeug 90 Jf90. In addition to the involvement of the UK and German firms, Alenia of Italy as well as Inisel of Spain are also participating in this project. The GEC-led team won the development contract

for the system in 1990, in a contract valued at £135 million.

RAM-System GmbH. This consortium, composed of BGT, Telefunken Systemtechnik, MBB, and Diehl, is a cocontractor for the RIM-116A Rolling Airframe Missile (RAM) alongside General Dynamics Pomona Division. In addition, RAM-System GmbH is designated as the "second source" for the RIM-116A, as well as management of the European portion of the program. The single launcher production line for the RIM-116A is being established in Germany.

Financial Results/Corporate Statistics

BGT Bodenseewerk Gerätetechnik GmbH, as a limited liability company, does not make public annual or quarterly financial statements. Therefore, no accurate information regarding turnover, profit or loss is available. However, BGT has an estimated annual turnover ranging from DM300 to DM350 million.

Strategic Outlook

BGT's strength is its tight focus on niche markets, in this case specifically weapon guidance systems. Although BGT cannot boast the development of any of its own missile products for today's market, the company is a world leader in the area of infrared missile technology. BGT has been involved in the infrared arena for years, and the experience shows, particularly through the pragmatic and technologically solid refinements to existing systems such as the AIM-9 Sidewinder. The most recent variations on this theme are highly attractive to the budget-conscious Bundeswehr, which is unlikely to fund revolutionary new systems, but rather will rely on upgrading proven systems.

Despite this trend, BGT has decided to take a few risks and has independently developed some new weapon systems. With the support of the Bundesminesterium für Verteidigung (BMVg), BGT is developing the SMAT/SMASH, an experimental submunitions family. The SMAT is an infrared-guided anti-vehicle submunition, while the SMASH is intended for attack against hardened aircraft shelters. The development remains in the design-study stage, and there are naturally questions regarding the continued government funding of this program. The SMAT/SMASH is intended for launch either from a container or a standoff weapon (such as the Matra Apache).

BGT has recognized the difficulty in relying on the BMVg for funding in the currently difficult German military market. Therefore, BGT is pursuing the development of a pair of private technology programs. Under this initiative, BGT is developing a precision guided mortar round, the Bussard, and a cannon-launched anti-helicopter munition, the EPHAG.

The EPHAG project has experienced technical problems. The current difficulty centers on the G-forces exerted on the sensitive guidance systems when fired from the Rheinmetall 120 mm smoothbore cannon. If the problems associated with the EPHAG can be resolved, BGT has a very promising system on its hands, particularly if the resolution comes quickly. A protracted development schedule will invariably affect the economy of the EPHAG system, and therefore its sales prospects. With the advent and proliferation of increasingly capable attack/anti-tank helicopter systems in all regions, a system such as the EPHAG would very likely find ready customers.

As BGT is a subsidiary of Diehl, this report will be combined with the Diehl report located in this binder in late 1995 and will no longer be individually updated.

Prime Award Summary

Information unavailable.

Program Activity

Business Interests. Some important aerospace and government programs currently under way at BGT are listed below. The briefs are intended to provide a listing of programs that are of major importance to the company. For detailed information or analysis of specific aerospace and defense programs or equipment, please refer to the appropriate FORECAST INTERNATIONAL binder (for example, AIRCRAFT, MILITARY VEHICLES,

WARSHIPS, MISSILES, ELECTRONICS, and GAS TURBINES). The following is an outline of the company's business interests:

- Missiles
- Seeker systems
- Precision-guided munitions
- Precision-guided submunitions
- Range finders
- Navigation and communication equipment
- Sensors

Intelligent Systems Division Guided Missile Systems

The focus of BGT's guided missile systems operations lies in the area of guidance and control systems. Bodenseewerk Gerätetechnik's fame in this realm was won through the firm's heavy involvement in the AIM-9 Sidewinder program. Since 1960, BGT has manufactured over 30,000 AIM-9B/FGW Mod.2 and AIM-9L air-to-air missiles, in addition to ground support equipment for these renowned missile systems, in support of the needs of European NATO member forces.

The AIM-9L/I has been supplied by BGT since the late 1980s to Luftwaffe and other NATO air forces. BGT has developed a modernization package for the thousands of early versions of the AIM-9: primarily the -9J, -9N and -9P. The AIM-9Juli, which features a seeker head that is a hybrid of the systems featured aboard the AIM-9N/P and the AIM-9L, offers nations with AIM-9J/N/P missiles in their inventories the ability to upgrade the performance of their older missiles. Interest has been registered with NATO member nations. BGT's most recent Sidewinder involvement was with Loral Aeronutronics for the AIM-9X. BGT provided a imaging infrared seeker based on TELL for this system.

Bodenseewerk Gerätetechnik began its experience with surface-to-air missile systems in the 1980s, with the adaptation of the AIM-9L into a ground-based air defense system (SHORAD), and in the development program for the RIM-116A Rolling Airframe Missile (RAM), and advanced air defense missile system which is able to defend against missile as well as aircraft threats. BGT's involvement included work in system simulation and work on rudder system for the prototypes of the RIM-116A. BGT involvement also included advanced radar/IR simulation study to determine the performance of the RIM-116 against a realistic target/background scenario, carried out at the behest of the Bundesminesterium der Verteidigung (BMVg), the Federal German Ministry of Defense.

BGT is a member of RAM-System GmbH, the European element of the RAM program. RAM-System GmbH is developing an enhanced RIM-116 seeker system which will enable the RIM-116 to counter extremely advanced anti-ship missiles which are guided by inertial or infrared seekers. BGT itself is responsible for the complete steering/control system for the RIM-116A.

The company is a licensed-producer of the AIM-120 AMRAAM missile. The AMRAAM is an all-weather, short-to-medium range fire-and-forget air-to-air missile designed for the destruction of hostile aircraft. The primary developers and producers of AMRAAM are Hughes Missile Systems Company.

BGT is also a major subcontractor on the all-weather, anti-tank missile system known as TRIGAT-LR. The TRIGAT-LR will replace Swingfire, HOT and TOW. The TRIGAT-LR's seeker is being developed by BGT in cooperation with British Aerospace and Thomson.

Recently, BGT has been exploring the development of advanced air-to-surface guided submunitions systems. The SMAT/SMASH, an experimental infrared-guided submunitions family, is under study as an advanced air-launched anti-ground target system. The SMAT will be launched either from a container or a standoff weapon (such as the Matra Apache), and will independently seek its target with a seeker calibrated for vehicles. The SMASH, on the other hand, will be launched much the same as the SMAT, but the SMASH will engage hardened aircraft shelters with a special penetrator, after which parked aircraft will be destroyed inside the shelter with a small warhead.

Guided Munitions

For over fifteen years BGT has been engaged in the area of guided munitions for anti-tank warfare and air defense applications. The Bussard, an experimental laser precision-guided-munition (PGM), is designed for launch from mortars. The Bussard program has so far shown promise, particularly in test-firing trials.

The EPHAG program, a guided munition for the Rheinmetall 120 mm smoothbore tank cannon, has been under study by BGT, for possible application in the Leopard 2 main battle tank. The EPHAG is equipped with an infrared seeker system, and will employ the discarding sabot principle which has been popularized in the unguided munitions currently in use in many of the world's armored forces. EPHAG is designed to be employed by main battle tanks against hostile helicopters. Please refer to Forecast International's *Missile Forecast* market intelligence service for further information concerning BGT's involvement with missile systems and subsystems.

Subsystems For Steering And Control

BGT, in addition to complete missile airframes, also develops and manufactures subsystems for steering and control for replacement and upgrade of missile systems already fielded. Included in this product area are target seeking units, inertial reference systems, and missile rudder actuation systems. The MBB Kormoran missile features a BGT inertial navigation system as well as missile computer.

BGT is a subcontractor for the guidance system of the TRIGAT/PARS-3GR anti-tank missile, alongside many other European firms of note (see TEAMING/COMPETITION/JOINT VENTURES). In addition to the seeker systems BGT has prepared for the Bussard and EPHAG programs, the firm is also investigating guidance systems for 155 mm artillery munitions. The 155 mm system currently under study is a combination infrared-millimeter wave radar system.

BGT activities in automation hold promise for many civil applications. BGT technology in the automation realm encompasses application including automotive, medical and software areas.

Control And Navigation Division

Flight Control Systems

BGT, in cooperation with GEC Avionics, developed and manufactured the triplex Command and Stability Augmentation System (CSAS) for the Panavia Tornado strike and interception aircraft. This relationship with GEC has extended to the flight control system, based on the Ada software language, for the Eurofighter Jagdflugzueg GmbH European Fighter Aircraft EFA/ Jagdflugzeug 90 Jf90. In addition to the involvement of the UK and German firms, Alenia of Italy as well as Inisel of Spain are also participating in this project. Insofar as civil aircraft are concerned, BGT counts itself as an important supplier to the powerful Airbus Industrie consortium. BGT supplies a digital automatic flight control computer for the Airbus A300 and A310, as well as the componentry for the Flight Control Unit (FCU) automatic pilot system aboard the Airbus A320.

Engine Control Systems

BGT is concerned with multiple facets of the Tornado combat aircraft, including the DECU 2000 second generation electronic engine regulation system for the RB.199 turbofans which power the Tornado, as well as RB.199's Turbine Blade Temperature sensor (TBT). BGT also manufactures the digital engine regulation systems for the auxiliary power units of the A320 and A330/340 aircraft, as well as automatic throttle control units for the A300 and A310. For the Franco-German PAH-2 Tiger combat helicopter, BGT is responsible for the digital engine control system of the MTU/Turbomeca/Rolls-Royce MTR 390 turboshafts.

Navigation

BGT efforts in navigation systems include both land and air-based systems. BGT involvement in the Tornado program includes supplying the attitude direction indicator, the flight situation display, and the lateral computer system. BGT land-based systems include the Manpack Target Acquisition System (TZG 10-90 series), the FNA-615 vehicle navigation system, and the GPA-200 Gun Positioning and Alignment System.

Sensors

BGT is a major source of sensors for a variety of applications, including sensors for aircraft, engines, missiles, and civil applications.