

Manufacturing

HEROES

Activity Book

TECHMASTER



LASERMAN

WELDFIRE



Career &
Technical
Education

COVER ILLUSTRATIONS BY DAVID LOUISSAINT, MULTIMEDIA DESIGN STUDENT AT WESTSIDE TECH

A Letter to the Parents...

By the time your child enters the first grade, this question may have been asked: “What do you want to be when you grow up?” Many times, children will respond with those professions chosen by their parents or some other career that seems glamorous and fun.

While the answer your child provides can be amusing, it’s now more important than ever to facilitate career awareness discussions at an early age. This will help connect the courses they are taking in school to the career they would eventually like to pursue. Indeed, for the child who wants to be an engineer and “build cool cars” it’s critical to discuss the role that math and science classes will play in helping him or her to become an engineer.

Because parents play such a key role in early career awareness Orange County Public Schools and the Manufacturers Association of Central Florida have developed this activity book to facilitate a discussion on the abundant and diverse array of careers available. Central Florida is home to more than 1,700 companies engaged in making everything from consumer goods, to high tech products to components that enrich every aspect of our lives. These companies are growing and have bright futures and will employ thousands of Central Florida residents. One of those future employees could be your son or daughter.

We encourage you to spend some time reviewing this activity book with your child. It’s loaded with information about leading manufacturing companies in our region and contains specific information on careers. Every child possesses unique and special talents. Through education, career exploration and hard work these talents can be applied to a successful career.

Sincerely,

Ronald Blocker
Superintendent
Orange County Public Schools

Janet Addair
Associate Superintendent
Career and Technical Education
Orange County Public Schools

Sherry Reeves
Executive Director
Manufacturers Association
of Central Florida

Orange County Public Schools School Board

Joie Cadle, Chairman - District 1

Darby Flynn, Vice Chairman - District 2

Rick Roach - District 3

Vicky Bell - District 4

Kathleen “KAT” Gordon - District 5

Nancy Robinson - District 6

Christine Moore - District 7

About the Manufacturers Association of Central Florida

The Manufacturers Association of Central Florida is a dynamic group of companies. We share the vision of a business climate where both manufacturers and non-manufacturers can expand, prosper and bring value to our community.

Career and Technical Education

Resources at Orange County Public Schools

Career Clusters

- Agriculture, Food and Natural Resources
- Architecture and Construction
- Arts, A/V Technology and Communication
- Business, Management and Administration
- Education and Training
- Energy
- Finance
- Government and Public Administration
- Health Science
- Hospitality and Tourism
- Human Services
- Information Technology
- Law, Public Safety and Security
- Manufacturing
- Marketing, Sales and Service
- Transportation, Distribution and Logistics

Learning Opportunities for All Ages

- Adult Education
- Apprenticeships
- Career Academies
- Career Certificates
- Careers Pathways
- Co-enrollment
- Dual Enrollment
- English as a Second Language
- GED Preparation
- Industry Certifications
- Online Courses and Programs
- Personal Interest
- Professional Development and Industry Training
- Youth Apprenticeship (high school)

For more information please visit us online at:

ocps.net or ReinventMe.net

Acknowledgements and Recognition

In addition to the manufacturing companies highlighted, Orange County Public Schools would like to thank the following organizations for their contribution to this project.



www.madeinflorida.org



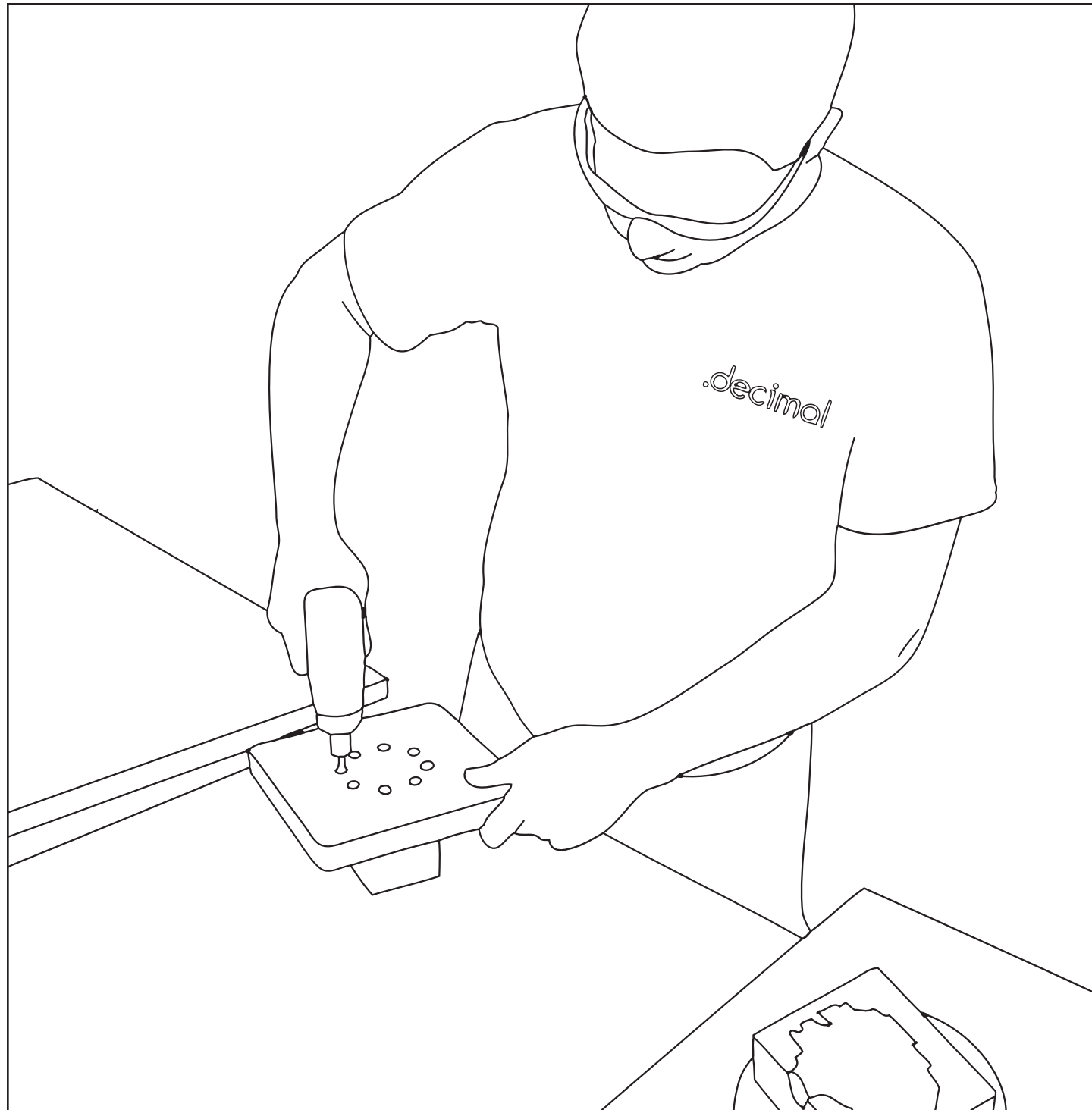
www.floridamep.org



www.orlandoedc.com



www.fl-ate.org



The .decimal manufacturing technician prepares raw material to be milled into custom cancer-fighting devices. Each part made at .decimal is as unique as a snowflake, designed by medical professionals around the world to help their patients fight cancer.

.decimal
121 Central Park Place
Sanford, Florida 32771
www.dotdecimal.com

Central
Florida has
1,750 manufacturing
companies. The state of
Florida has 17,850.



.decimal

Vocabulary Discovery

Quality: Having a high degree of excellence or superiority.

Recycle: To undergo reuse or renewal.

Inspect: To examine carefully and critically, especially for flaws.

Lathe: A machine that holds metal and rotates it about a horizontal axis against a tool that shapes it.

Accuracy: The condition of being precise, correct, and exact, and free from error or defect.

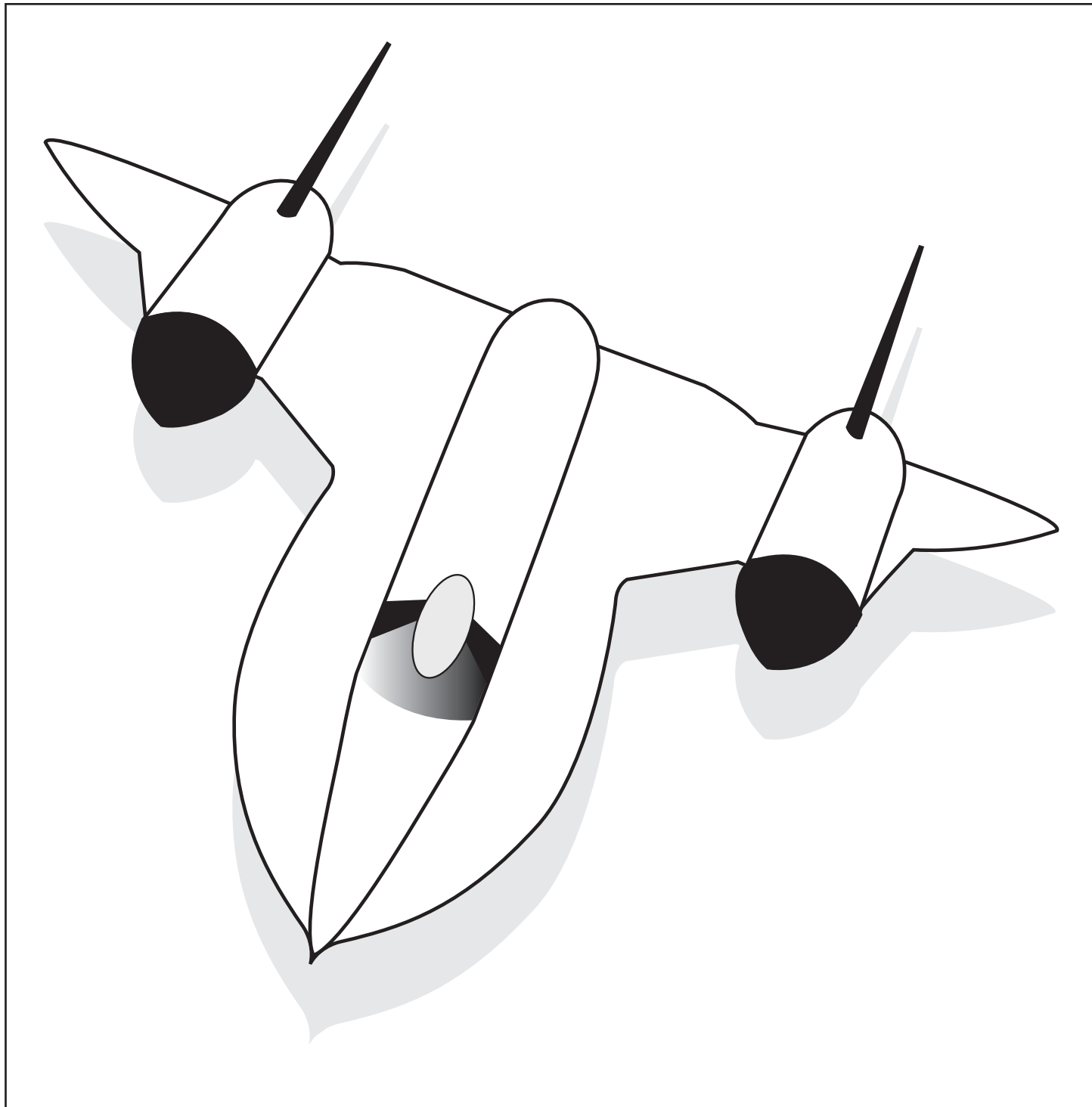
Careers at .decimal

Manufacturing Technician:

The manufacturing technician is a position within the Production Department. The primary function for the manufacturing technician is to facilitate the machining of raw material to final product for delivery to the customer. The manufacturing technician will also complete paperwork and enter required information into .decimal computer software for manufacturing requirements. He/she should have an organized, detail-oriented work method.

Shipping Clerk:

The main role of the shipping clerk is to package products carefully so that no damage occurs during shipping. The shipping clerk will complete paperwork for each shipment as well as inspect the parts being shipped to ensure that they meet the company's quality standards. The shipping clerk must be organized and pay careful attention to details.

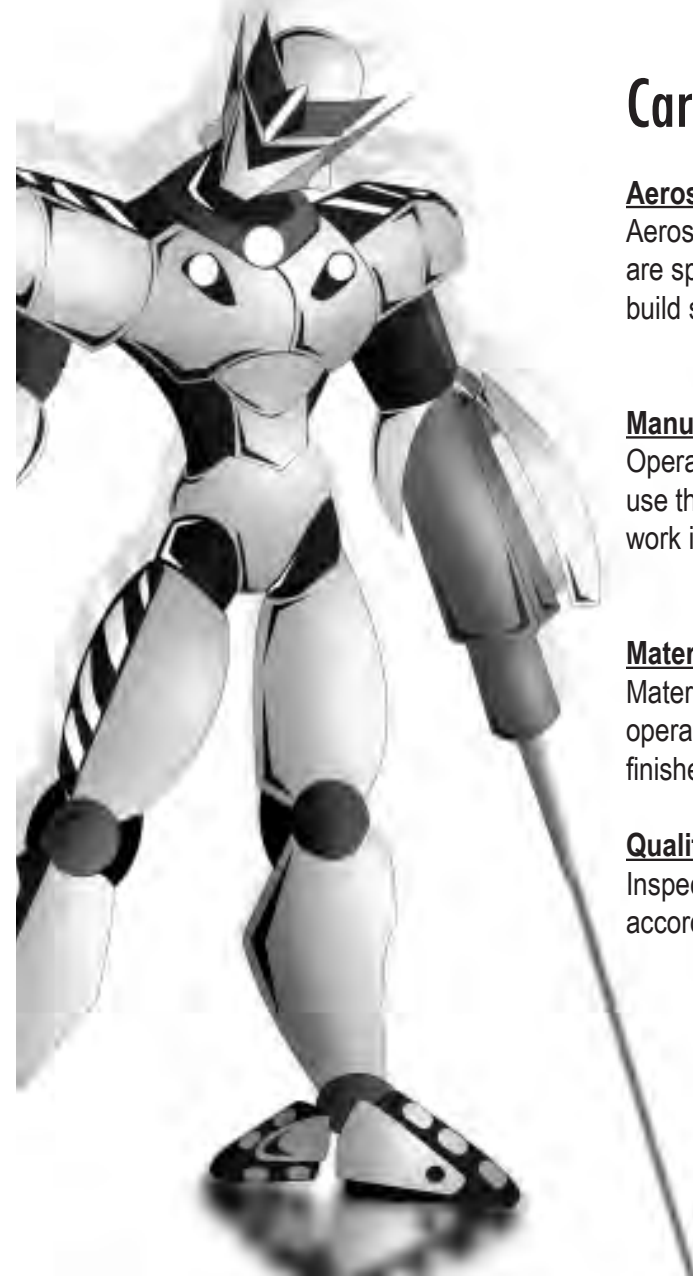


At Lockheed Martin, engineers, manufacturing operators, material handlers, inspectors, and many others work together to design, build, and test high tech equipment. From satellites and airplanes to robots and ships, Lockheed Martin is building tomorrow.



6801 Rockledge Drive
Bethesda, Maryland 20817
www.lockheedmartin.com

Central Florida has nearly 42,000 individuals employed in manufacturing. The state of Florida has over 370,000.



Lockheed Martin

Vocabulary Discovery

Engineer: A person who uses math, science, and specialized knowledge to solve a problem.

Design: Creating the plans of how something should work or look.

Satellite: A high tech device that flies in space and sends pictures and information to people on Earth.

Robot: A machine that does something for a person on command.

Careers at Lockheed Martin

Aerospace Engineer:

Aerospace engineers design and help build airplanes and spaceships. They are specially trained in physics, math, computers, and other sciences to help build strong, fast vehicles.

Manufacturing Operator:

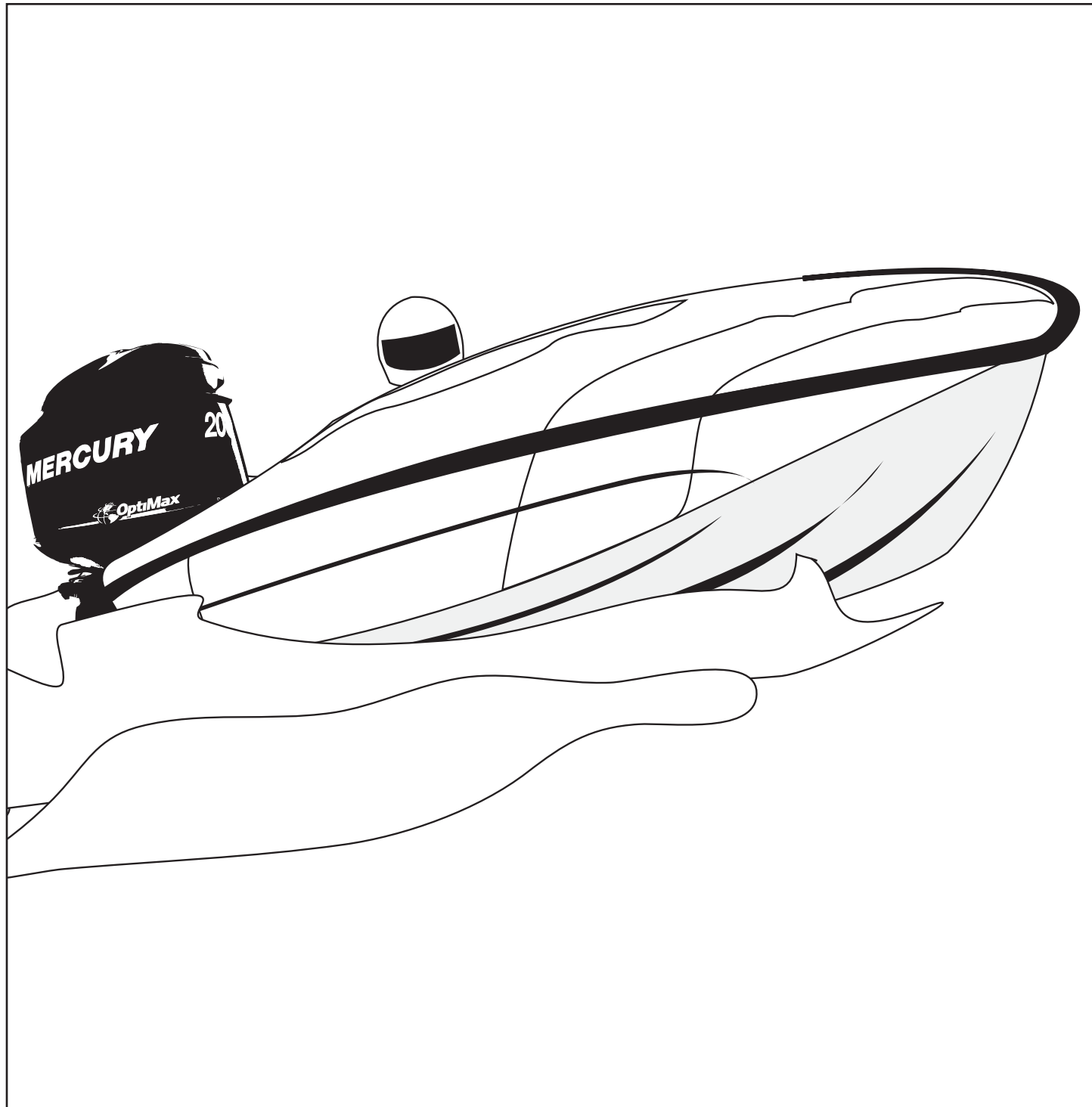
Operators are the people who actually build all these amazing machines. They use the design plans from the engineers and assemble the parts. Operators work in teams.

Material Processor:

Material processors take parts from the stockroom for the manufacturing operators to use. They also move the parts around the factory, and prepare the finished parts for shipment.

Quality Inspector:

Inspectors check parts and machines to make sure they are put together according to the engineer's designs. Inspectors have to be very detail oriented.



This is a racing boat that uses a Mercury Marine outboard motor. It can race at over 100 knots (115 mph). The motor uses plastic injection molded parts and electronic parts that are designed and manufactured at the Mercury Marine factory in St. Cloud, Florida. Mercury Marine supplies motors for recreational, commercial and government marine applications.



1000 Robinson Ave.
St. Cloud, Florida 34769
www.mercurymarine.com



The average wage for a manufacturing job in Central Florida is \$52,348; this is approximately \$3,700 more than the State of Florida's average wage of \$48,652.



Mercury Marine

Vocabulary Discovery

Knot: A unit of speed equal to one nautical mile or about 1.15 statute miles per hour.

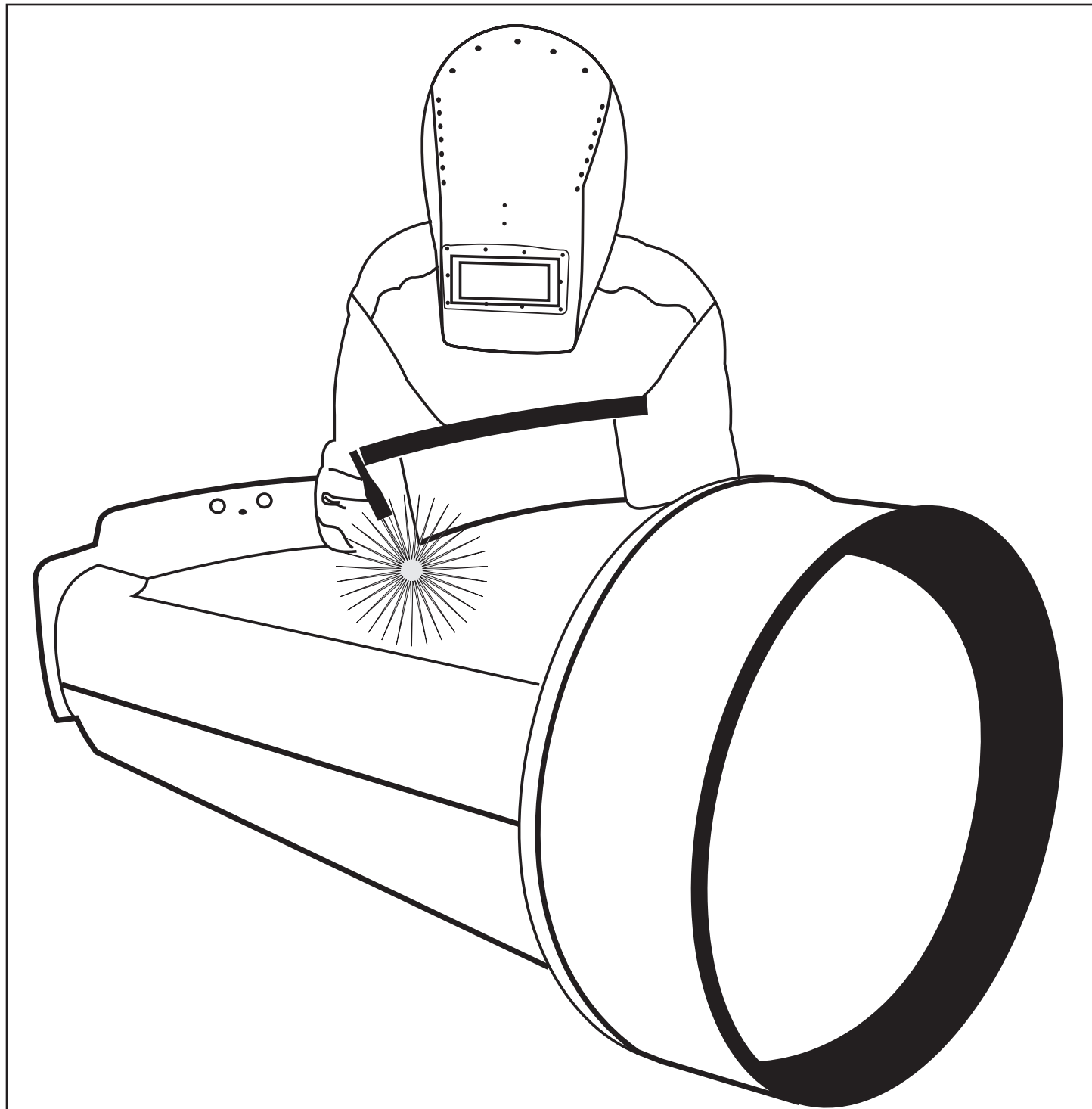
Outboard Motor: A motor that is attached to the boat on the outside of the hull.

Plastic Injection Molding: A way of making plastic parts by injecting hot liquid plastic into a mold and letting it cool and become solid.

Careers at Mercury Marine

Engineer:

The engineers at Mercury Marine design and make parts for outboard engines. They use computers with Computer Aided Design programs to design the parts. The parts are either injection molded plastic or electronic parts that use printed circuit boards. Every part must meet specifications for safety, quality, performance and materials.



The Mitsubishi Power Systems welding technician welds an industrial gas turbine transition during the manufacturing process. The transition is used to transfer hot combusted gas into a turbine which spins at 3,600 rounds per minute. The spinning motion generates electricity that is used in homes around the world. Mitsubishi Power Systems is a world-wide provider of power solutions.



2287 Premier Row
Orlando, FL 32809
www.mpshq.com

Central
Florida
manufacturing
companies produced over
\$2.2 billion dollars in
total wages last year.



Mitsubishi Power Systems

Vocabulary Discovery

Arc: An electric current between an electrode and a base material that melts the metals at the welding point.

Argon: The third element in the periodic table that is an inert gas. It is commonly used in the welding process to shield the molten pool from air which would cause oxidation (like rust).

Metal: A chemical element, compound, or alloy that is a good conductor of both electricity and heat.

Molten: A physical process that changes a solid to a liquid.

Welding: A manufacturing process that uses an electric arc to join materials, usually metals. The arc is surrounded by an inert gas called argon. Once the arc is made, it locally melts the material to form a small pool of molten metal. The welder then adds a filler material to the pool of molten metal to fill the weld joint. When the molten pool cools, it becomes a strong joint which is referred to as a weld.

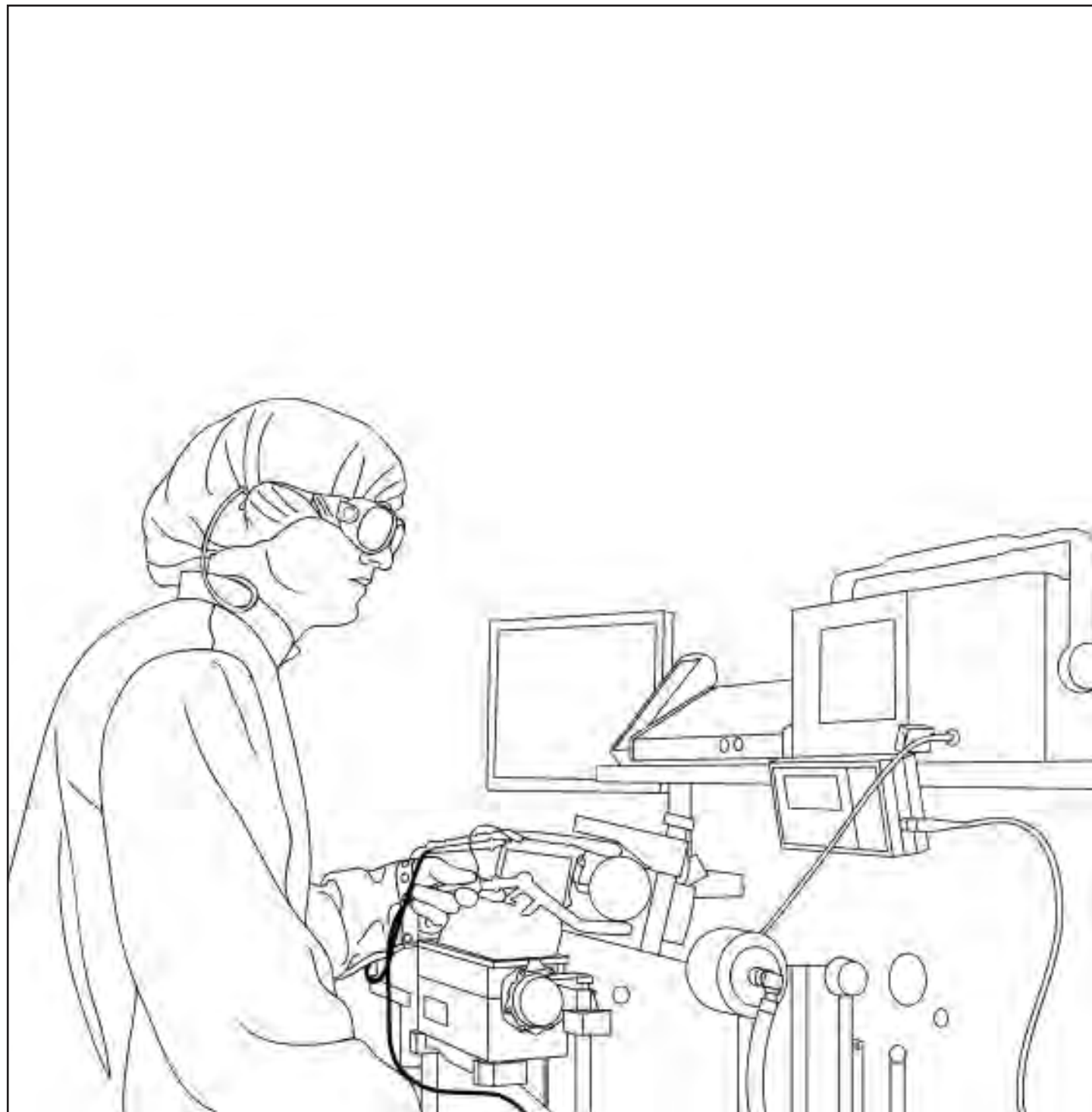
Careers at Mitsubishi Power Systems

Welding Technician:

The primary role of the welding technician is to prepare and weld surfaces as instructed by a technical drawing. In addition, the welder must complete in-process penetrant and visual inspections to verify the quality of their work. Reading, math and "eye to hand" coordination is important to being a good welder.

Machining Technician:

The machining technician operates and programs many types of equipment. These include milling, drilling, grinding, and coating robots. Additionally, the machining technician must use very accurate measuring devices to insure the settings they placed in the machine are performing as expected. Reading, math and the ability to comprehend engineering drawings are important to being a good machining technician.

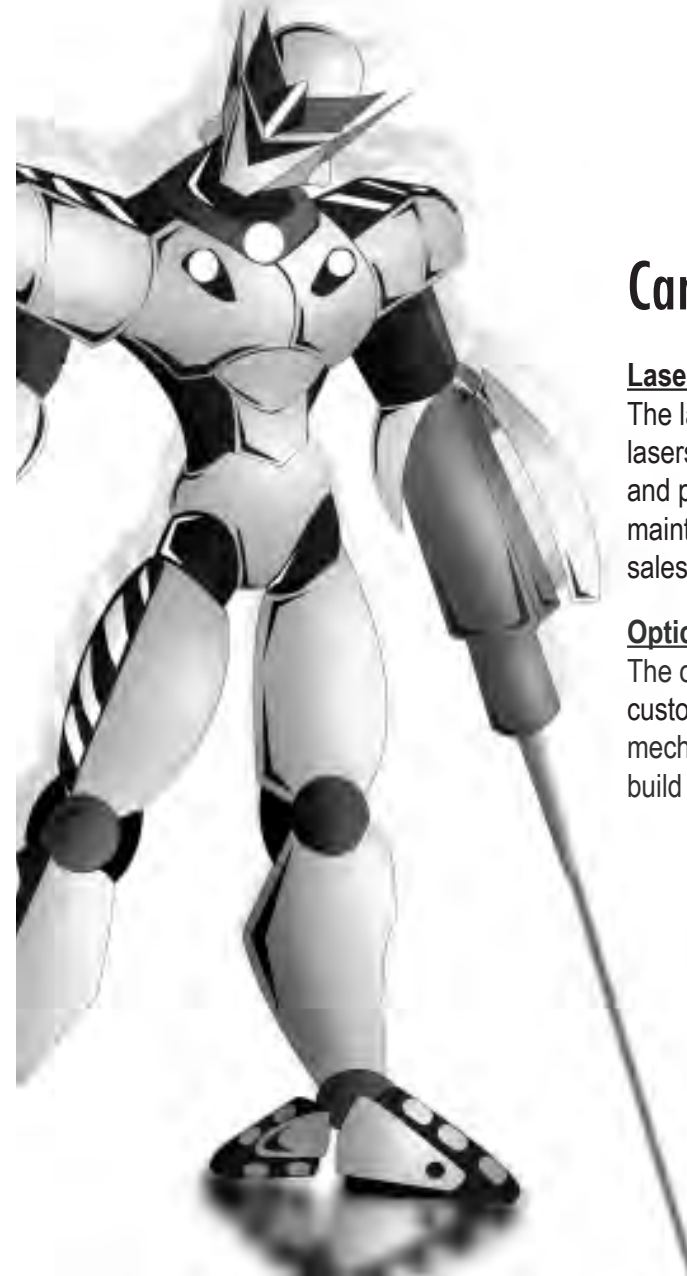


Northrop Grumman's laser technicians assemble, align and test complex opto-electrical devices per written instructions. Northrop Grumman Laser Systems is an industry leader in the design, development and manufacture of precision electro-optic targeting and laser designation systems.

NORTHROP GRUMMAN

2787 South Orange Blossom Trail
Apopka, Florida 32703
www.northropgrumman.com

Nearly
4% of total
employment in Metro
Orlando is involved in the
manufacturing
industry.



Northrop Grumman, Laser Systems

Vocabulary Discovery

Density: The relationship between mass and volume.

Fiber optic cable: A cable made of fine glass that can carry a light signal over long distances.

Laser: Short for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation. A device that creates and amplifies electromagnetic radiation of a specific frequency through the process of stimulated emission.

Voltage: In electricity, the measure of the force.

Optic: Any of the lenses, prisms, or mirrors of an optical instrument.

Careers at Northrop Grumman, Laser Systems

Laser Technician:

The laser technician will assemble, test, maintain, and operate different kinds of lasers and systems that use lasers. Laser technicians work with the assembly and production of laser systems and laser devices. They prepare them for maintenance and operation, troubleshooting, repair, research, development, sales and service.

Optical Assembler:

The optical assembler will perform alignment of optical hardware to meet customer specifications. Optical assemblers will build complex electro/opto-mechanical assemblies, sub-assemblies and optical assemblies as well as build and clean optical components.



The Celmark International employee is mixing raw materials into the tank. These raw materials are being blended together to manufacture a cream that is used for skin care. Celmark International is a manufacturer of many creams and liquids used as dietary supplements and skin care products.



2600 Titan Row
Orlando, Florida 32809
www.celmarkint.com

Almost
5% of total
employment in
Florida is involved in the
manufacturing
industry.



Celmark International

Vocabulary Discovery

Liquid: composed of molecules that move freely among themselves, but do not tend to separate like those of gases; neither a gas nor solid.

Cream: a soft solid or thick liquid containing specific ingredients, applied externally for a prophylactic, therapeutic, or cosmetic purpose.

Raw material: material before being processed or manufactured into a final form.

Blend: to mix smoothly and inseparably together.

Tank: a large receptacle, container, or structure for holding a liquid or gas.

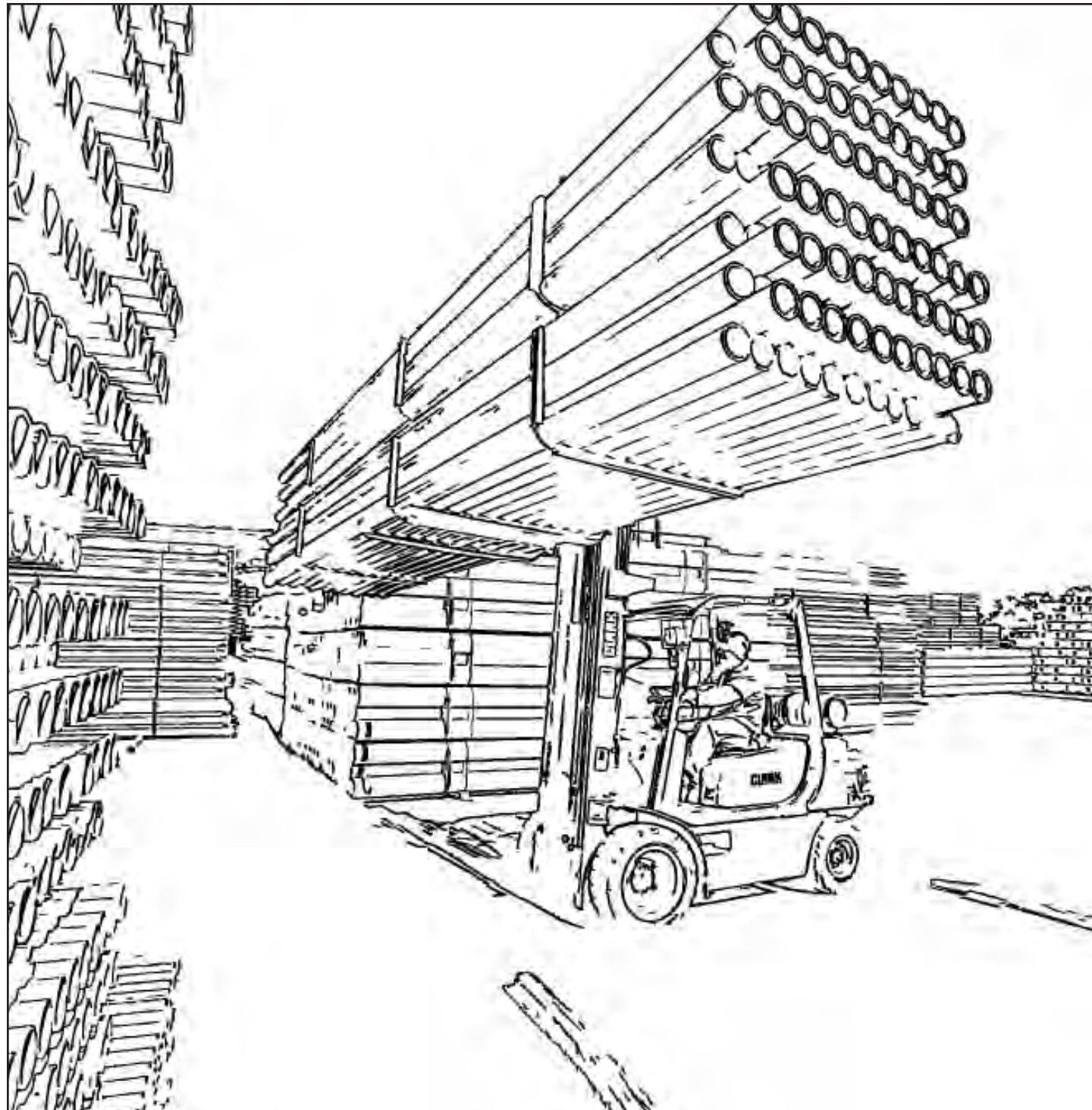
Careers at Celmark International

The Topicals Research Development Manager:

The topicals research development manager makes laboratory samples of creams for testing and approval. They also write blending procedures for the cream when it is manufactured in the larger tanks.

Production Manager:

The production manager creates a schedule of when each cream or liquid will be manufactured and filled. He or she will check to make sure all raw materials and components necessary to make the product have been received.



The picture above shows one of Accord Industries' forklift drivers moving green sewer PVC pipes into inventory while it waits for customer shipment. Accord Industries' Universal 100 division is Florida's largest PVC pipe manufacturer and was established in 1972. They currently produce 150 different PVC products ranging from 1/2" to 12" diameter. PVC pipe is used for plumbing, irrigation and sewer needs.



4001 Forsyth Road
Winter Park, Florida 32792
www.accordindustries.com

Accord Industries

Vocabulary Discovery

PVC Pipe: Plastic pipes used to move drinking water, waste water and chemicals.

LED: LED stands for "light emitting diode".

Forklift: a small vehicle with a forked platform in front used for moving products from one location to another.

Concrete: A mixture of cement, rock and sand.

Careers at Accord Industries

Forklift Driver:

The forklift driver operates the forklift and moves products and inventory in accordance with job requirements.

Sales Representative:

Sales representatives work to gain new customers delivering sales presentations and customer proposals.



Transportation
equipment
manufacturing
employees earn an
average wage of
\$75,000 per year.



Assembly workers put springs in the bed frame and make sure that they are tight (employees need to know what size and color of springs to use) and attach the link fabric. They wear safety equipment (safety glasses, gloves and ear plugs) as part of their job to protect them against accidents. Invacare is a global leader in the development of home and long-term care medical products.



Electronic
instrument
manufacturing
employees earn an average
wage of \$68,000 per
year.



Invacare

Vocabulary Discovery

Assembler: person who puts parts together to build something.

Spring: a metal elastic device that returns to its shape or position when pushed or pulled or pressed.

Frame: a structure supporting or containing something.

Safety Glasses: item designed to protect the eyes of an assembler against parts or particles.

Ear Plugs: item designed to protect the ears of the assembler against excessive noise.

Careers at Invacare

Spring Assembler:

Spring assemblers place springs in beds as instructed in the work orders. They must have knowledge of all line operations and sub-assembly stations in the beds assembly department. They also perform quality testing on springs to ensure proper placement in the beds.



Boxes and point of purchase displays are manufactured by cutting, folding, printing and gluing corrugated sheets using a flexo-folder gluer or diecutter. Once the boxes or displays are manufactured, they are shipped to the customer. Based in Central Florida, Central Florida Box Corporation is a leading provider of packaging and display products.

CFB DISPLAY Group

Central Florida Box Corporation

2950 Lake Emma Road, Suite 1000
Lake Mary, FL 32746
www.centralfloridabox.com



Turbine
and power
transmission equipment
manufacturing employees
earn an average wage of
\$67,000 per year.

Central Florida Box Corporation Vocabulary Discovery

Box Manufacturer: A business that has equipment to score, slot, print and join corrugated sheets into boxes.

Shipping Container: A container that is sufficiently strong to be used in commerce for packing, storing and transporting commodities.

Corrugated: The material that is formed by gluing one or more sheets of fluted corrugating medium to one or more flat facings of linerboard.

Point of Purchase Displays: Corrugated displays that are used to promote the sales of the product.

Careers at Central Florida Box Corporation

Machine Operator:

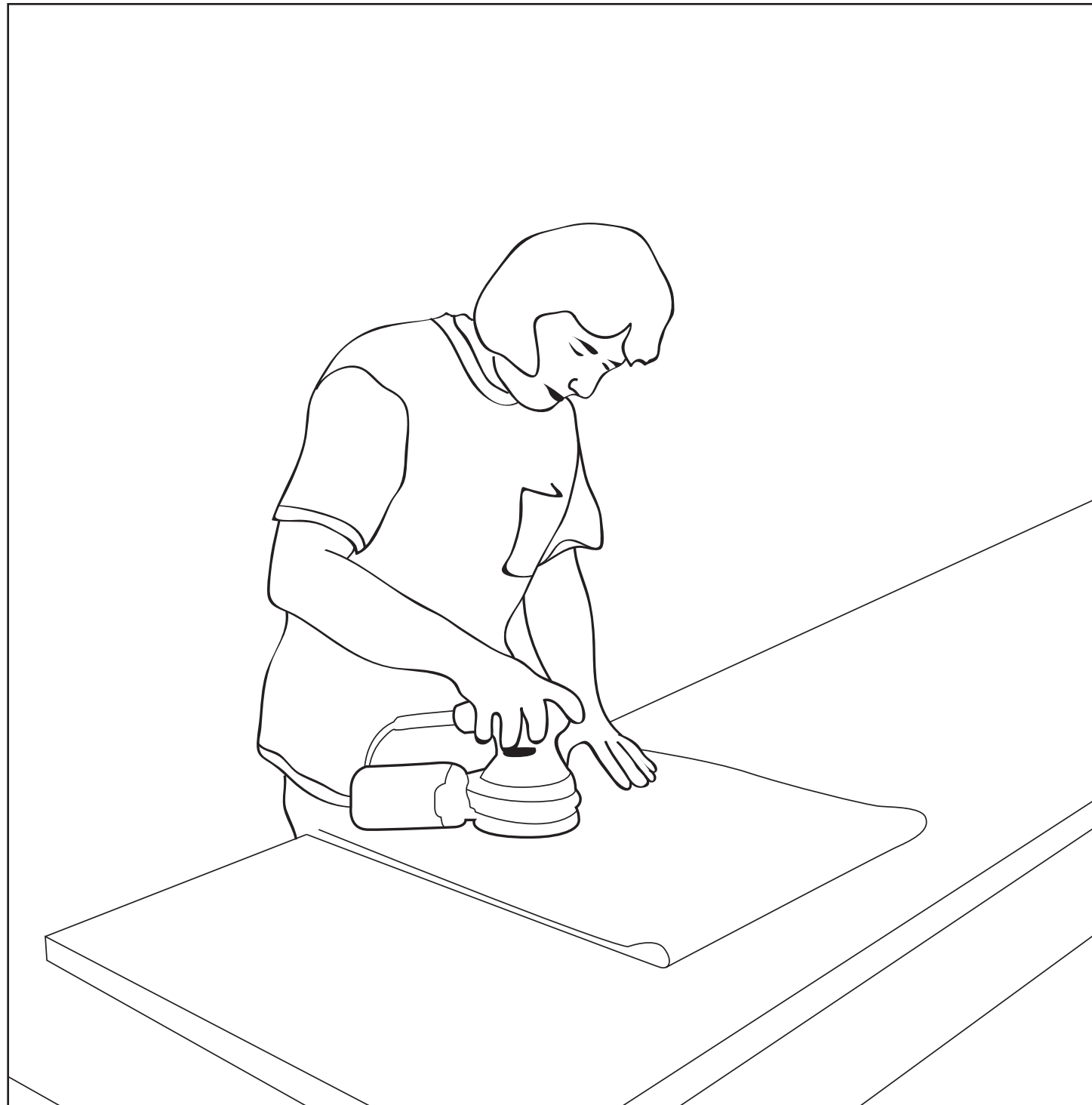
The machine operator runs and supervises the flexo-press or diecutter that manufactures the box. The machine operator is responsible for setting up and running the machine that cuts, prints, folds and glues the boxes. The machine operator also checks the boxes as they are running through the machine to make sure that they are cut and printed correctly.

Customer Service Representative:

The customer service representative (CSR) performs all activities related to servicing the customers, from preparation of the initial quote to final delivery and billing of the product. The CSR interacts directly with the customer as well as with all other departments to insure that each customer receives their quotes and orders on time.

Graphic Designer:

The graphic designer is a position within the design department. The graphic designer works with the sales representative and the customer to create artwork and original graphics for the packaging created by the structural designer.



This Metal Essence machine operator is sanding a completed part to be sent to a customer. They manufacture many different kinds of parts, including parts for race cars, airplanes, and even Walt Disney World Resort®! Metal Essence is an Orlando-based company engaged in the fabrication of metals and plastics.

M Metal Essence, Inc.

930 Britt Court, Suite 124
Altamonte Springs, FL 32701
www.metalessence.com

In the past five years,
Central Florida has added
approximately 150
new manufacturing
companies.



Metal Essence

Vocabulary Discovery

Machine Shop: Workshop where metal is cut and shaped by machine tools.

Piece-work: Work done and paid for by the piece.

Raw material: Material before being processed or manufactured into a completed part.

Quality Control: a system for verifying and maintaining a desired level of quality in a product or process by careful planning, use of proper equipment, continued inspection, and corrective action as required.

Zero-defect: Quality control that strives for a perfect production process, resulting in flawless products.

Aerospace: the industry concerned with aircraft, missiles, satellites and spacecraft; of, or relating to the Earth's atmosphere and nearby space; of, or relating to the science, technology and industry associated with aircraft and missiles.

Careers at Metal Essence

Machinist:

A machinist performs set-up and operation of various machine tools in order to accomplish production machinery functions. A machinist may use milling, drilling, grinding, and other machines. Machinists also decipher sketches, blueprints, and engineering details. They also provide assistance in establishing set up and layout methods, order of operations, and application of required parts and materials.

Plant Manager:

A plant manager manages and oversees overall plant operations which may include finance, manufacturing, manufacturing engineering, materials, quality assurance/control, human resources and information systems. A Plant manager makes recommendations to improve productivity, quality, and efficiency of operations.

Quality Manager:

A quality manager is responsible for administering the company's quality program in accordance with customer and company requirements.

Manufacturing HEROES

Activity Book



Career &
Technical
Education



<http://council.stemaid.ucf.edu>



www.fl-ate.org



www.floridamep.org



www.madeinflorida.org



www.orlandoedc.com

NORTHROP GRUMMAN

www.northropgrumman.com

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