



FCX
SYSTEMS

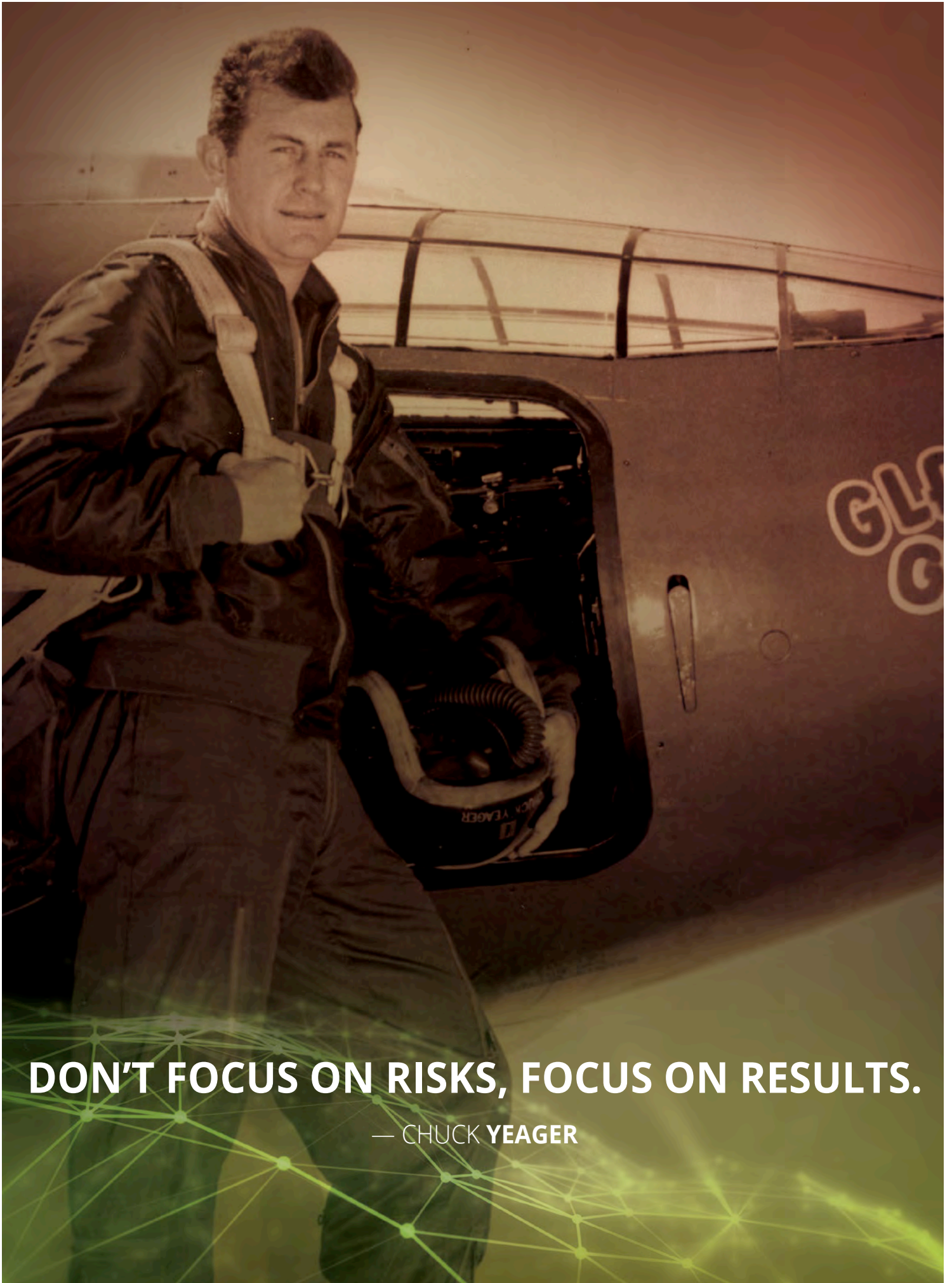
Engineered for Endurance



**SPECIALISTS IN SOLID-STATE FREQUENCY
CONVERTERS AND GROUND POWER
SUPPORT FOR MILITARY | INDUSTRIAL
COMMERCIAL | SHORE POWER
AROUND THE WORLD**

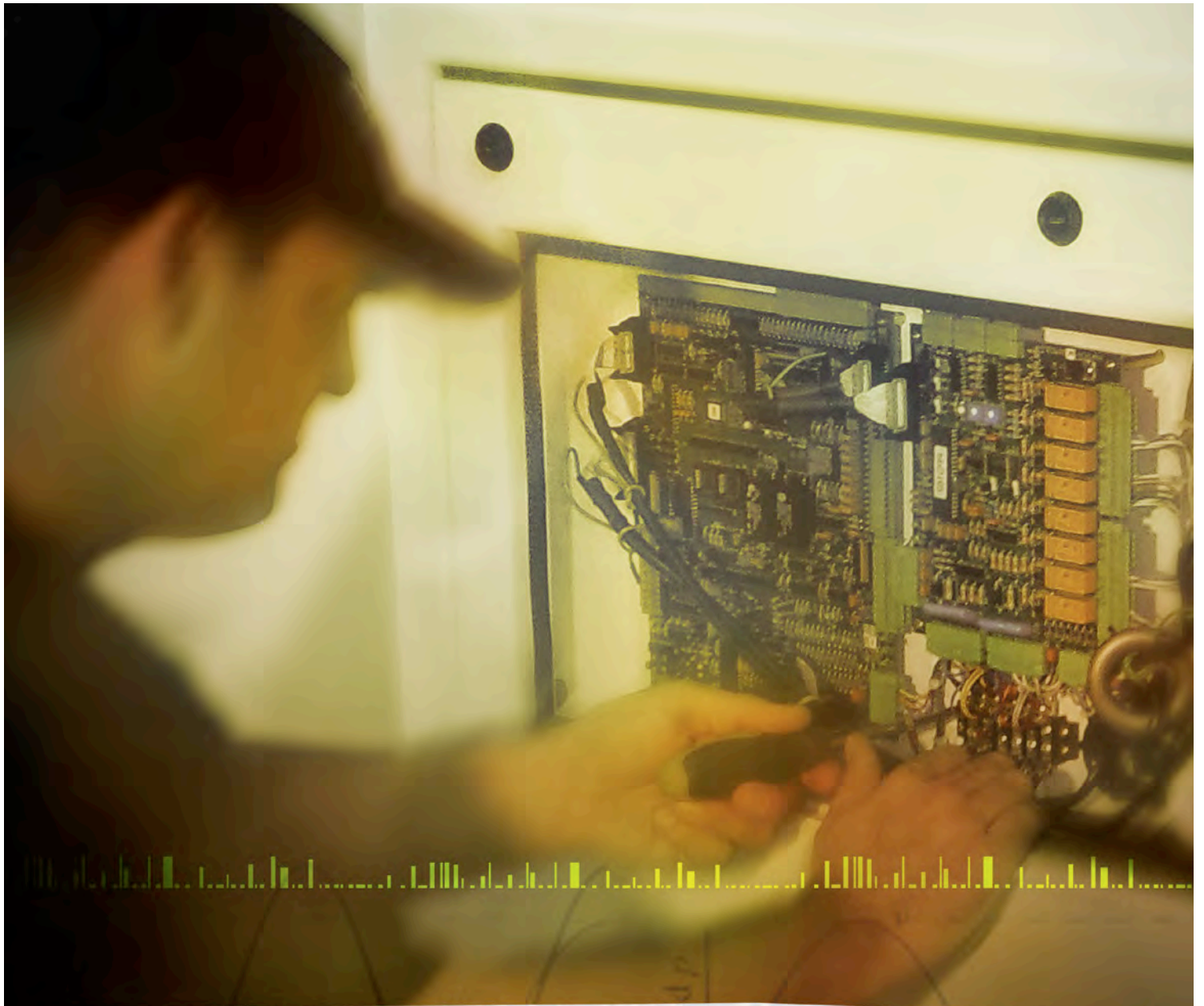
FREQUENCY CONVERTERS • DIESEL GROUND POWER (GPU)
DC POWER SUPPLIES • CUSTOM SYSTEMS





DON'T FOCUS ON RISKS, FOCUS ON RESULTS.

— CHUCK YEAGER



WE DO.

The diesel generators used to power the Patriot Missile System around the world demand large quantities of diesel fuel and substantial maintenance – until FCX found a better way.

In the early 2000s, 11 other companies attempted – and failed – to develop a power supply for a 270 VDC military aircraft (F-22).

A large floating dry dock requiring 50 Hz power was pulled across the ocean to the Grand Bahama Shipyard . . . where 60 Hz was the only utility available.



THE WORLD'S LEADING SOLID-STATE FREQUENCY CONVERTER MANUFACTURER

The extreme conditions, precise specifications and high reliability for frequency conversion are well known by FCX. It's our job to understand the problems, and it's our specialty to solve them. That's why we've assembled the industries' leading experts in power conversion.



FCX
SYSTEMS

Engineered for Endurance

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HEADQUARTERED IN
MORGANTOWN, W.VA.,
FCX DELIVERS DEPENDABLE
PRODUCTS, **ON TIME** AND
ON BUDGET.

Product dependability, durability, ease of operation and sustainability are the hallmarks of all FCX products. Our equipment is designed, manufactured and tested in-house under strict quality control standards for maximum reliability and performance.



MILITARY



INDUSTRIAL



COMMERCIAL



SHORE
POWER

With a great deal of experience, outstanding workmanship and the highest standards of engineering, FCX develops and produces intelligent solutions that meet 100 percent of the requirements set forth by our customers.

Frequency Converters

312 KVA Central System Power

Line Drop Compensators/Gate Box

200 KVA to 4,000 KVA

Diesel Ground Power (GPU)

DC Power Supplies

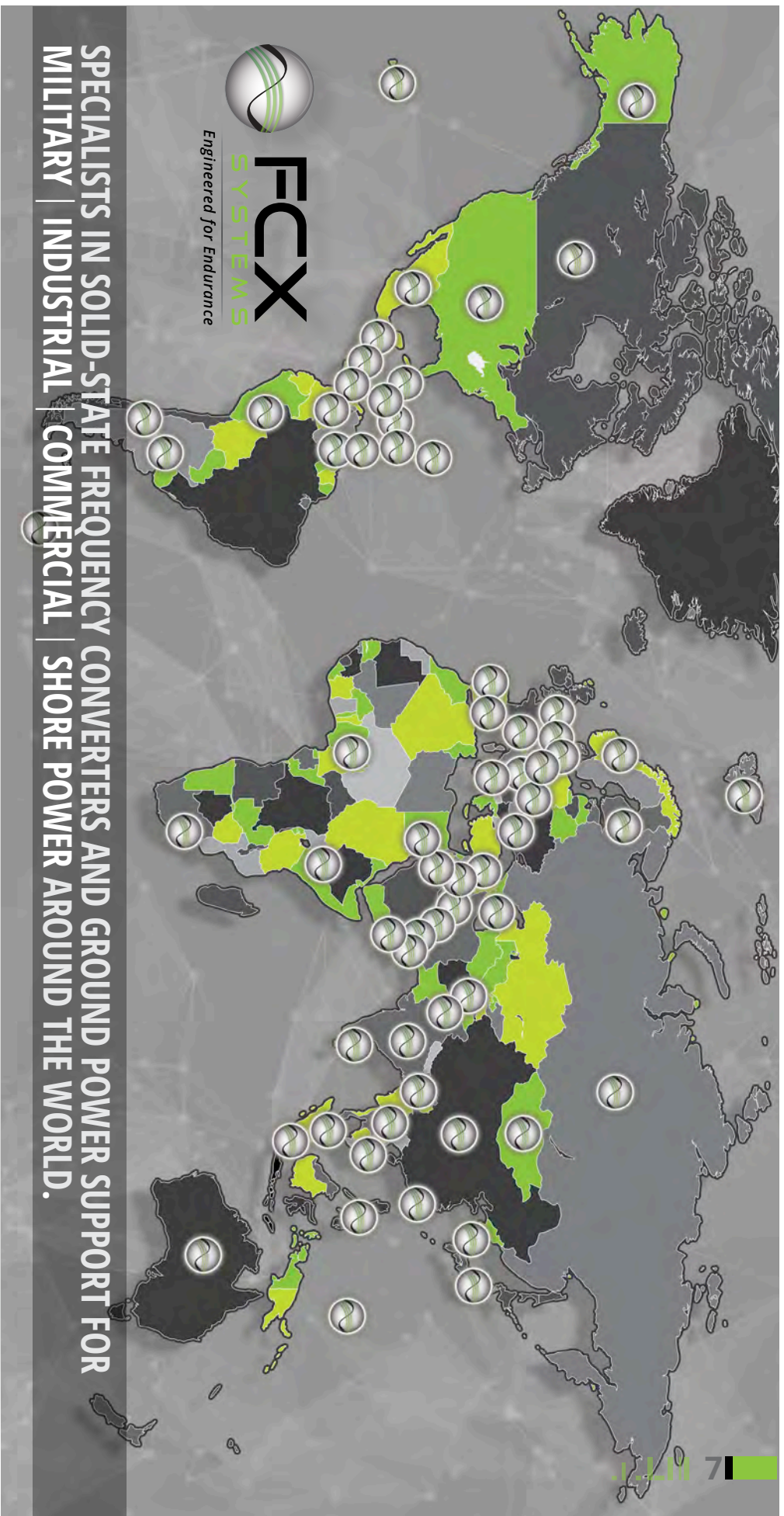
28 VDC through 600 FLA Caster Mounted

270 VDC Power Converters

270 VDC Military Precision Power
Converters

Custom Systems





Since 1987, FCX units have been installed on every continent and in more than 75 countries.

On our own production floor, we develop solutions that meet your requirements. With worldwide support 24/7, FCX provides consultation, troubleshooting and replacement parts directly to you.

Through comprehensive service – from initial contact through production and ongoing support – FCX customers become long-term partners. The expert knowledge of our workforce allows us to offer individual solutions which perfectly meet all project requirements.



POWERFUL SOLUTIONS

Engineering Complex Power Supply for F-22 Test Program

In the early 2000s, the engineering staff from Edwards Air Force Base (AFB) distributed an inquiry regarding a power supply for a 270 VDC military aircraft. FCX did not initially respond to the inquiry; however, no viable solutions were presented by the 11 companies that did respond. The engineering staff from Edwards AFB asked FCX to review the specifications.

It was not a normal 270 VDC requirement as defined in MIL-

STD-704; this required a fast, dynamic response with excellent voltage regulation.

FCX completed its unit and air shipped it to Lockheed Martin's Vehicle System Simulator in Fort Worth, Texas. After passing stringent test parameters, the unit was subjected to undisclosed tests of a confidential nature, and passed. The FCX solution was cleared for the existing test program and non-disclosed future program requirements.

The same unit was then air-shipped to Edwards AFB, installed and commissioned for the first F-22 of the test program.





POWERFUL SOLUTIONS

Replacing Diesel Generators for the Patriot Missile System

Patriot Missiles, the defensive anti-missile system designed by Raytheon, are installed around the world to protect cities subject to missile attack.

While utility power around the world is either 50 Hz or 60 Hz, the Patriot system incorporates several elements that require reliable 400 Hz power. Therefore, diesel generators are utilized.

Engine generator efficiency is poor, which increases the fuel demand. As operating hours increase, the rotating engines and generators require substantial maintenance.

FCX developed a special solid-state frequency converter, optimized to change the available utility power into the power required by the Patriot system. The FCX solution significantly reduced diesel fuel costs for Patriot Missile System installations worldwide.





POWERFUL SOLUTIONS

Powering F-35s Aboard Aircraft Carriers



Anticipating the deployment of F-35 airplanes aboard aircraft carriers, the U.S. Navy issued a requisition for development of a system to supply power to these 270 VDC aircrafts, with a minimum impact on the existing equipment and space.

FCX used its experience with the 400 Hz AC and 270 VDC high-performance power supplies and, by cross-utilizing a large portion of the existing 400 Hz system, provided a substantial savings in cost and space.

The actual 270 VDC addition is a small pod that can be mounted in out-of-the-way locations.

FCX units can be seen on the moving line and forward fuselage assembly areas for the F-35 Joint Strike Fighter at Lockheed Martin Corp's factory located in Fort Worth, Texas.





POWERFUL SOLUTIONS

Solid-State Frequency Converter for a Floating Dry Dock

In 2008, a large floating dry dock – containing motor loads for cranes, capstans, ballast pumps and fire pumps – was transported to the Grand Bahama Shipyard. The dry dock required 50 Hz power, while the Bahamas utilizes 60 Hz power.

To supply the 50 Hz power needed for the dry dock, two 1,000 KVA Caterpillar diesel generators were required. The generators required huge amounts of expensive diesel fuel instead of inexpensive utility power.

A solid-state frequency converter running off the utility power solved this problem.

The second challenge was designing, building and testing a solid-state frequency converter that was rated 2,000 KVA and was capable of operating large inductive loads.

FCX engineered the converter to use low-frequency switching to reduce losses. An input voltage of 12.7 KV and an output voltage of 20 KV helped reduce wire costs between the converter and the dry dock.

Two units were manufactured by FCX and the dry dock was electrically divided down the middle. At that time, the dual units comprised the world's largest solid-state frequency converter.

The two 2,000 KVA units may be paralleled at a future date.



**FCX: TRUSTED BY THE
WORLD'S MOST RECOGNIZED
ORGANIZATIONS**

FCX CLIENTS

AIRLINES

Aerolineas Argentinas
Air New Zealand
Air Wisconsin
AirTran
Alaska Air
Ali-Gator Air
American Airlines
American Eagle
Asiana Airlines
Bangladesh Airlines
British Airways
Continental Airlines
Delta Airlines
EgyptAir
El Al Israel Airlines
EVA Air
Executive Airlines
Icelandair
JAT Airways
Lufthansa Airlines
Nippon Cargo Airlines
Northwest Airlines
Porter Airlines
Schiener Air
Skywest Airlines
South American Air
Southern Air
Southwest Airlines
United Airlines
US Airways
Virgin Galactic

AIRPORTS

Abu Dhabi Airport
Adelaide Airport
Beijing Airport
Buffalo Niagara Airport
Burcharest Otopeni Airport
Charlotte Airport
Chattanooga Airport
Dallas/Ft. Worth Airport
Denver Airport
Hong Kong Airport
Indianapolis Airport

Incheon Airport
Jacksonville Airport
Lafayette Airport
Logan Airport
Louisville Airport
Manchester Airport
Memphis Airport
Myrtle Beach Airport
New Delhi Airport
Orlando Airport
Philadelphia Airport
Providence Airport
Raleigh-Durham Airport
San Diego Airport
Schiphol Airport
Tallahassee Airport
Tampa Airport
Yeager Airport

MILITARY

Aberdeen Test Center
Abu Dhabi Military
Air National Guard
Al Dhafra Air Base
Army National Guard
Australian Navy
Bangor Submarine Base
Barbers Point Naval Air Station
Camp Lejeune
Charleston Air Force Base
Creech Air Force Base
Davis Mountain Air Force Base
Dover Air Force Base
Dutch Navy
Edwards Air Force Base
Eglin Air Force Base
Egyptian Navy
Elmendorf Air Force Base
F.E. Warren Air Force Base
Fort Benning
Fort Bliss
Fort Campbell
Fort Drum
Fort Eustis
Fort Huachuca

Fort Meade
Fort Sill
Fort Stewart
German Air Force
Hill Air Force Base
Holloman Air Force Base
Homestead Air Reserve Base
Hunter Army Air Field
Hurlburt Field
Israeli Air Force
JRB Belle Chasse
JRB Fort Worth
Keesler Air Force Base
Kulis Air National Guard Base
Langley Air Force Base
London Submarine Base
MCAS Beaufort
MCAS Camp Pendleton
MCAS Cherry Point
MCAS Kaneohe Bay
MCAS Miramar
MCAS Yuma
Moody Air Force Base
Naval Air Station Jacksonville
Naval Air Station Keflavik, Iceland
Naval Air Station Key West
Naval Air Station Lemoore
Naval Air Station Mayport
Naval Air Station New Orleans
Naval Air Station Norfolk
Naval Air Station North Island
Naval Air Station Oceana
Naval Air Station Patuxent River
Naval Air Station Pearl Harbor
Naval Air Station Sigonella, Italy
Naval Air Station Whidbey Island
NASA
Naval Air Weapons Station China Lake
Naval Surface Warfare Center Dahlgren
Nellis Air Force Base
Patriot Missile Support - Saudi Arabia
Redstone Arsenal
Robins Air Force Base
Royal Saudi Air Force
Scott Air Force Base

Sheppard Air Force Base
Tinker Air Force Base
Tobyhanna Army Depot
Tyndall Air Force Base
U.S. Air Force
U.S. Army
U.S. Coast Guard
U.S. Marines
U.S. Navy
U.S. Army Proving Grounds -
Yuma
USCG Air Station Alameda
USCG Air Station Clearwater
USCG Air Station Miami
Wheeler Air Force Base
Whiteman Air Force Base

ADDITIONAL

Aerotech
Ameribridge
Ardry Trading
BFGoodrich
Boeing
Burns & McDonnell
Carolina GSE
CH2M Hill
Colonna's Shipyard
Compass GSE
Contrack International
Eaton
Evergreen Aviation
Federal Express
Fisher Scientific
GE Corporate
Grand Bahamas Shipyard
Graybar
Honeywell
Jupiter Corporation
L-3 Communications
Lockheed Martin
McDonnell Douglas
MCM Engineering
New York City Transit Authority
Northrop Grumman
Pitney Bowes

Raytheon
Rockwell Collins
SAIC
Sultanate of Oman
ThyssenKrupp
UPS
Westinghouse
Wyle Laboratories

The above is a representative list of our aviation, governmental and business clients.



FINDING A BETTER WAY TO DO IT SINCE 1987

A Legacy of Engineering Innovation

- 1987** FCX was the first company to design and manufacture a 312 KVA solid-state frequency converter
-
- 1990** Developed the world's largest solid-state frequency converter: 1,250 KVA
-
- 1991** The first company to provide for No Break Power Transfer (NBPT) in solid-state frequency converters using the converters' capabilities, FCX became instrumental in assisting McDonnell Douglas and Boeing in acquiring new synchronizing programs for their aircrafts.
-
- 1992** FCX solid-state frequency converter recommended for all Boeing, McDonnell Douglas and Airbus aircrafts
-
- 1993** First solid-state frequency converter manufacturer to be UL listed
-
- 1995** The only approved solid-state frequency converter for use with the Patriot Missile
-
- 1996** Developed the world's first 500 KVA solid-state frequency converter, commissioned by the Egyptian Navy
-
- 2000** Approved by the U.S. Air Force for the 270 VDC power supply for the F-22 Raptor
- Provided 400 Hz power supply units for the Israeli Air Force
-
- 2002** Began the design and manufacture of an AC/DC/PC-Air Combo unit that was recognized as the most efficient (green) PC-Air unit, while accommodating the aircraft's need for 400 Hz and/or 28 VDC power
-
- 2003** FCX technology supported the Patriot Missile Air Defense System during Operation Iraqi Freedom
-
- 2004** Awarded delivery of Shipboard 400 Hz Power for the U.S. Navy Dock Landing Ship (LPD) and Northrop Grumman's Guided Missile Destroyer (DDG) programs
- Awarded order for the first 10 270 VDC power units for F-35 Joint Strike Fighter, installed at the Test and Evaluation Hangar, Naval Air Station in Patuxent River, Md.
-

- 2005** Awarded delivery of Shipboard 400 Hz Power for the U.S. Coast Guard Deep Water Project with Northrop Grumman
-
- 2006** Designed, manufactured and installed 270 VDC power units and cooling units (both DX and chilled water) at Edwards AFB, in preparation of F-35 arrival at the facility
-
- 2007** Delivered a one-of-a-kind cooling unit to support the YAL-1 Airborne Laser – requested by Boeing
-
- 2008** Developed the world’s largest solid-state frequency converter – dual 2,000 KVA units installed at the Grand Bahama Shipyard
-
- 2009** Expanded the PC-Air product line to include Commercial Air-Handler Unit (AHU) that utilizes chilled water/glycol mixture from a central chiller plant; 46 of the units are installed at the Denver International Airport
- First manufacturer to supply Point-of-Use Air for Lockheed Martin’s F-35 Lightning II JSF program
- Awarded multi-year contract for delivery of 270 VDC units for installation on U.S. Navy aircraft carriers
-
- 2010** Designed, manufactured and installed 75 PC-Air units for the Indira Gandhi International Airport, New Delhi, India
-
- 2011** Designed and manufactured unique, highly technical 270 VDC/28 VDC units for installation and use on the Lockheed Martin F-35 Assembly Line operation in Ft. Worth, Texas
-

- 2012** FCX initial FCXtreme 90 KVA power unit installed at Providence, R.I.
-
- 2013** Awarded contract from Boeing to supply GPUs for F-15 aircraft military sale to Saudi Arabia – LARGEST U.S. FOREIGN MILITARY SALE IN HISTORY
-
- 2014** Designed and manufactured 180 KVA unity power factor frequency converter to handle Boeing 787 (and equivalent size) aircraft
-



In 2000, FCX was presented with the Presidential E-Award for Export Excellence, the highest award the federal government bestows on a manufacturer.

In 2016, FCX received the President’s E-Star Award, becoming the first W.Va. company in the history of the program to receive the award.

AWARDS & RECOGNITION

Solid-State Frequency Converter for a Floating Dry Dock

In 2000, FCX was awarded the Presidential “E” Award for Exports by U.S. Secretary of Commerce Bill Daley on behalf of President Clinton. In 2016, FCX received the “E” Star Award for Exports by U.S. Secretary of Commerce Penny Pritzker. The President’s “E” Award is the highest recognition any U.S. entity can receive for making a significant contribution to the expansion of U.S. exports. According to Secretary Pritzker, “The “E” Awards Committee was very impressed with FCX Systems’ more than 300 percent growth in export sales from 2012-2015.”

US Secretary of Commerce Penny Pritzker, FCX Systems Senior Vice President – Production and Project Engineering Matt Howell, and FCX Systems President and CEO Craig Walker in Washington, DC for “E” Awards presentation, May 16, 2016.



In 2016, FCX Systems was acknowledged with a “Gold” Composite Rating from Boeing in its most recent Supplier Performance Report.

The “Gold” Composite Rating is Boeing’s highest distinction and can only be achieved by earning “Gold” status in both “Quality” and “Delivery” performance metrics.



