CASE STUDY: Optimizing Test Cell Assembly

Reducing Setup Time by 55% & Generating $1.4M in Value

Project Snapshot

Industry: Aerospace / Combustion Engineering
Challenge: 2-week setup times were killing schedule efficiency.
Result: Reduced assembly to 5 days; $125 K annual savings per cell.

---

1. Opening Hook – The Challenge

A major engine test facility faced long hardware assembly times that slowed every test campaign. Each program required roughly **two weeks** of setup before testing could begin—burning valuable schedule and resources. The customer's target was simple but ambitious: **cut assembly time noticeably without compromising quality or safety**.

---

2. Problem Definition

Every test campaign lasted **10–12 months**, yet the early setup phase consumed excessive time for assembling combustor-related hardware, updating valves, reconnecting fuel and instrumentation lines, and aligning pressure vessels.

This delay not only extended test schedules but also inflated cost, since each test-cell day was far more expensive than shop preparation work. The mission was to identify **time-saving opportunities** that also improved technician ergonomics, tool safety, and process consistency.

---

3. My Approach

We mapped the full assembly process **from start to finish**, assigning time and cost to each step to build a verified baseline.
The study revealed **five key improvement areas** with strong return-on-investment potential:

1. Midframe Configuration and Pre-Mounted Assemblies

Reusing a single midframe created about **2 days of delay** between tests. By acquiring a second midframe (~$50 K), the facility could swap immediately when one was removed. In

ition, mounting the test article on the new midframe before shipment eliminated another **ay** of work.

- **Net saving:** ~2.5 days per campaign (~$8 K per test, $32 K per year).
- **10-year benefit (with 3 % inflation): ≈ $365 K** total savings versus the initial $320 K linear estimate.

2. Control Valve Upgrade

Valve swapping consumed a full day per campaign. Installing a dual-valve configuration—a large-trim control valve with a parallel fine-control valve—handled all test scenarios without changeovers.

- **Investment:** $28 K
- **Linear saving:** $150 K over 10 years; **inflation-adjusted value: ≈ $170 K**

3. Modular Fuel Line System

We re-engineered the fuel manifolds into a **fixed base cart with a modular quick-disconnect segment**, cutting configuration time from 2 days to 1.

- **Annual benefit:** ~$15 K
- **10-year inflation-adjusted value: ≈ $170 K** in avoided downtime

4. Permanent Instrumentation

Flow meters were repeatedly relocated across tests, wasting a full day each campaign. Installing dedicated units eliminated this activity.

- **Investment:** $60 K
- **Linear saving:** $150 K; **inflation-adjusted: ≈ $170 K** over 10 years

5. Ergonomic Tooling Improvements

Manual torquing with large wrenches was slow and physically demanding. A **hydraulic wrench mounted on a mobile cart** improved torque accuracy, safety, and cut setup by **½ day** per cycle.

- **Annual saving:** ~$7.5 K
- **Inflation-adjusted 10-year value: ≈ $85 K** total—and significant intangible benefit in technician safety and morale.

---

4. Implementation and Validation

worked with the customer's engineers to rank improvements by cost and payback, grating changes into planned maintenance cycles. Each enhancement—new midframe, modular lines, dual-valve set, instrumentation, and tooling—was verified over two consecutive test campaigns to quantify before-and-after performance.

---

5. Results and Impact

- **Assembly time reduced by ~55 %**, dropping from ~10 days to ~5 days
- **Annual savings:** ≈ $125 K per test cell
- **10-year inflation-adjusted impact: ≈ $1.43 million** in cumulative savings
- Additional benefits included improved safety, reduced technician fatigue, and higher schedule predictability

These efficiency gains allowed the customer to **start testing up to a week earlier per campaign**, translating into accelerated product validation and significantly better utilization of high-value test assets.

---

6. Takeaway & Forward Value

This project illustrates how a **systems view of operations**, supported by time studies and ROI modeling with inflation awareness, can drive both technical and financial performance. By focusing on bottlenecks and quantifying the long-term economic effect, we converted a recurring cost center into a competitive advantage.

Today, these same methods guide how I help clients enhance reliability, turn-time, and long-term asset value across turbine testing and combustion programs.

Note: Inflation-adjusted values assume a **3 % annual escalation rate** compounded over 10 years, representing future cost-equivalent savings in today's dollars.