ADVANCED SOLID ROCKET MOTOR PROJECT STATUS

Tenth Workshop for Computational Fluid Dynamics (CFD) Applications in Rocket Propulsion

28 April 1992

Keith Coates
EE 71
MSFC

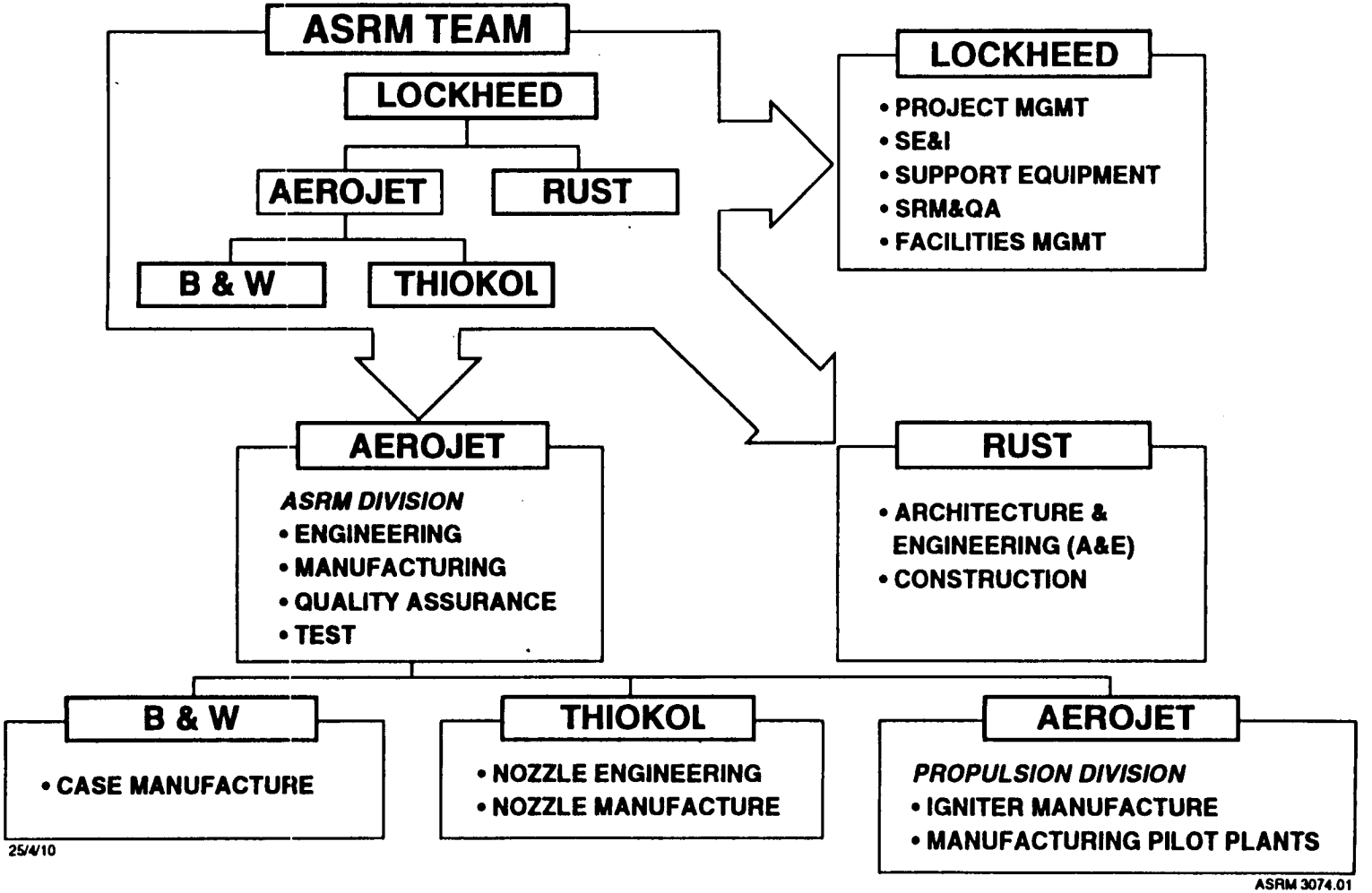
OUTLINE

- **Project Objectives**
- **Team**
- **Locations**
- **Motor Design**
- **Schedule**
- **Technical Issues**

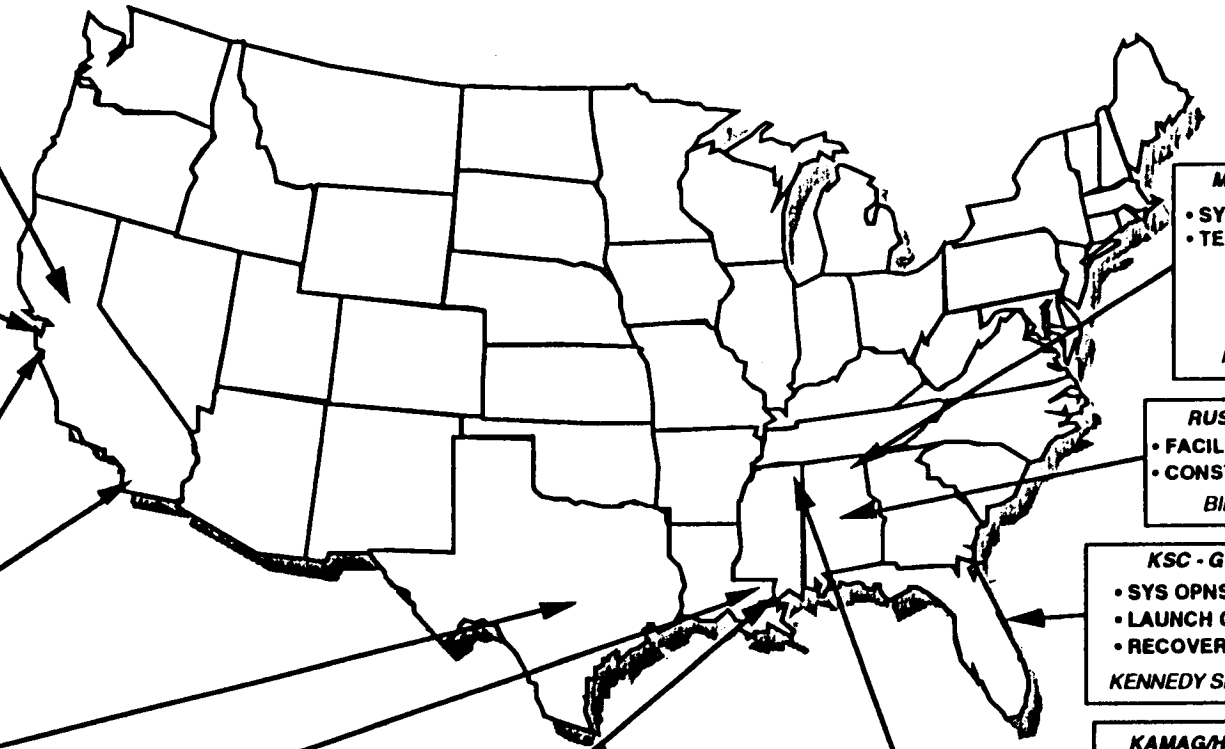
PROJECT OBJECTIVES

- **Improve System Safety and Reliability**
  - Design Features
  - Enhanced Quality
  - Reproducibility
- **Improve Shuttle Payload Performance: 12,000 lb**
- **Optimize Program Cost**
- **Promote Competitive SRM Industry**
  - Construct and Operate Government Owned Manufacturing and Test Installations

ASRM PROJECT TEAM



ASRM PROJECT TEAM LOCATIONS



AEROJET PROPULSION DIVISION
- IGN DESIGN & MFG
- SYS ANAL
- PILOT PLANT

SACRAMENTO, CA

LMSC - CO MGMT
- SYSTEMS ANAL

SUNNYVALE, CA

LMSC SANTA CRUZ
- IGNITION COMPONENTS

SANTA CRUZ, CA

D3 TECH INC
- GSE DESIGN

SAN DIEGO, CA

LOCKHEED AUSTIN DIV.
- GSE MFG
- GSE ENGR MGMT
- DATA ACQUISITION CONTROL SYSTEM

AUSTIN, TX

MAF
- FACILITY CONSTRUCTION
- NOZZLE MFG

MICHOUD, LA

SSC - TEST PROJ MGMT
- FACILITY CONSTRUCTION
- SYSTEMS TEST

BAY ST. LOUIS, MS

IUKA/YELLOW CREEK
- PROJECT MGMT
- FACILITIES CONSTR
- MOTOR MFG

IUKA, MS

MSFC - PROJ MGMT
- SYSTEMS ENGR
- TESTING - HBTA
  STA
  TPTA
  48" MTR

HUNTSVILLE, AL

RUST INTERNATIONAL
- FACILITIES A&E
- CONSTRUCTION MGMT

BIRMINGHAM, AL

KSC - GSE PROJ MGMT
- SYS OPNS & LOGISTICS
- LAUNCH OPERATIONS
- RECOVERY OPERATIONS

KENNEDY SPACE CENTER, FL

KAMAG/HULS AMERICA, INC
- KDT (TRANSPORTER)
- VERTICAL BORING MILL
- IPDI-PROPELLANT CURATIVE

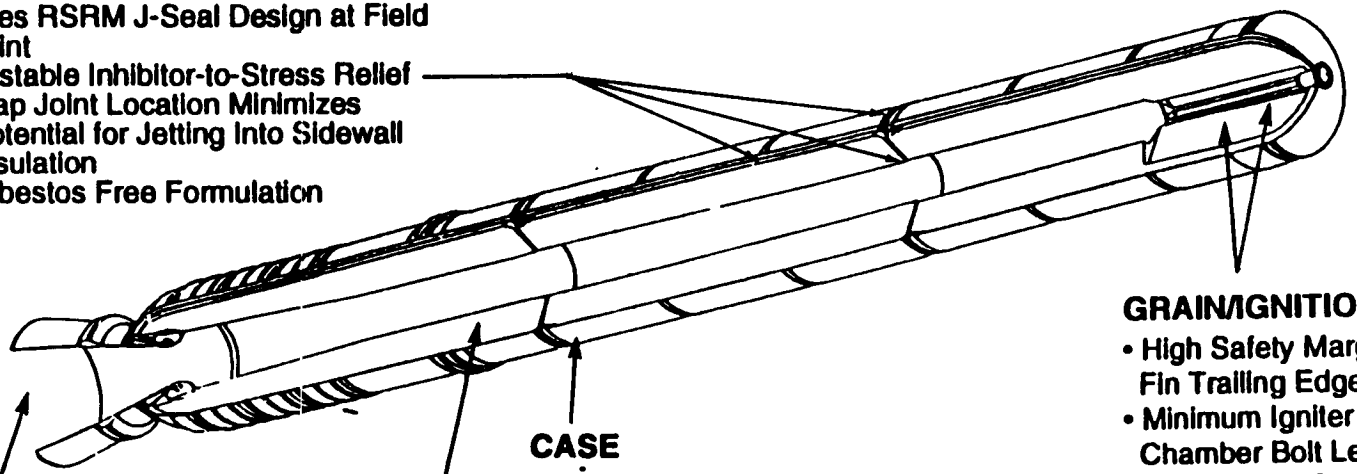
ULM, GERMANY

25/4/10

ASRM 3074.02

ASRM MOTOR DESIGN HIGHLIGHTS

INSULATION
- Uses RSRM J-Seal Design at Field Joint
- Castable Inhibitor-to-Stress Relief Flap Joint Location Minimizes Potential for Jetting Into Sidewall Insulation
- Asbestos Free Formulation



GRAIN/IGNITION
- High Safety Margin In Forward Fin Trailing Edge
- Minimum Igniter Chamber Bolt Leak Paths
- Expendable Carbon Filament Chamber
- TBI Initiator Eliminates S&A Device Leak Paths

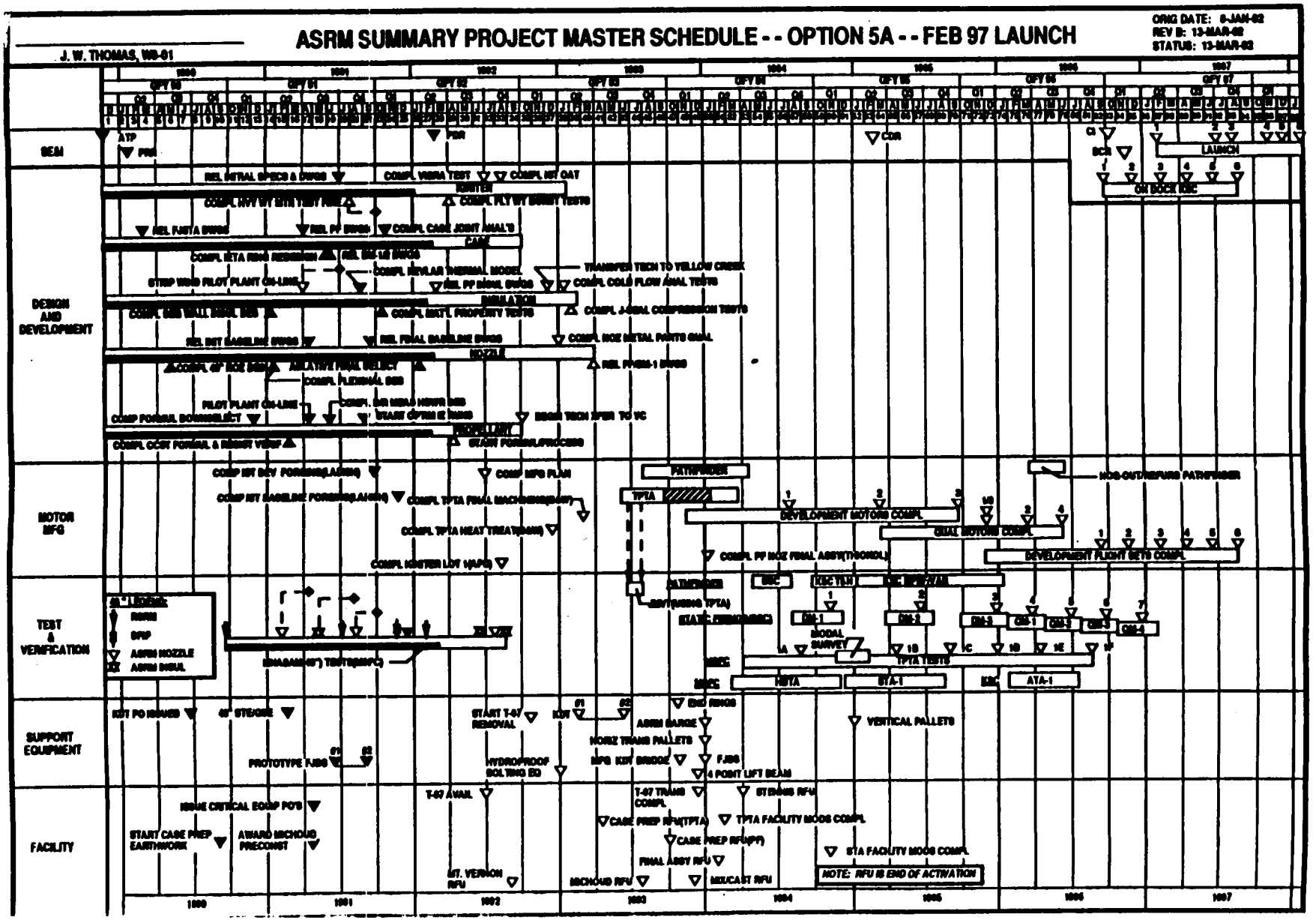
CASE
- Two Field Joints
- High Fracture Toughness
- High Stress Corrosion Resistance
- Welded Factory Joints
- Integral Stiffeners and ET Attach Ring In Aft Segment Eliminates Failure Points Experienced With Bolt-On Stiffeners and Ring

NOZZLE
- Minimum Joints and Inlet/throat rings
- Improved process ablative materials
- Eliminates flexseal cowl and boot assembly

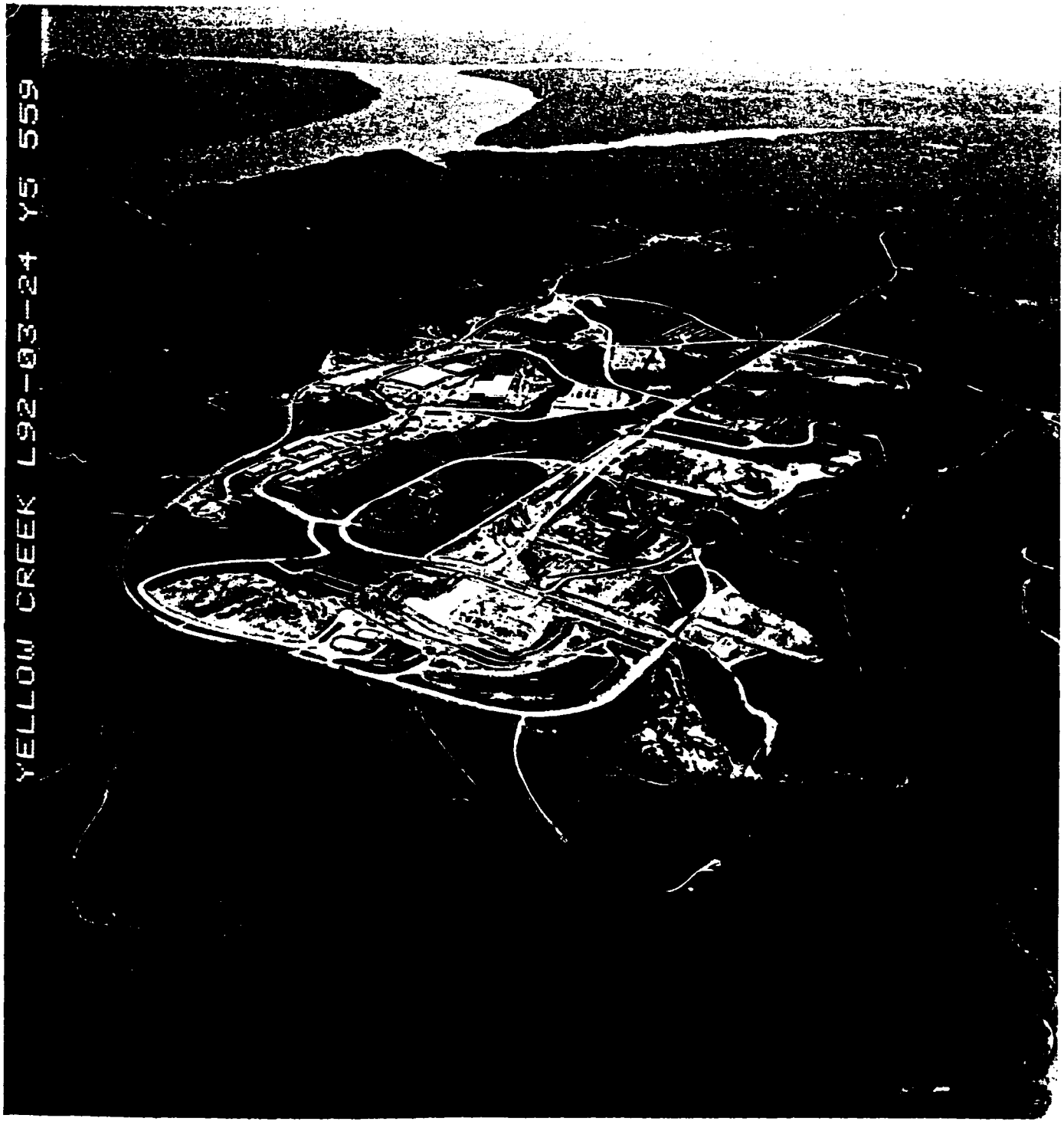
PROPELLANT
- Industry Proven HTPB Propellant with over 60M lbs Successfully Produced
- Formulated and Proven for Continuous Mix Process
- Positive Margins

ASRM DESIGN PARAMETERS

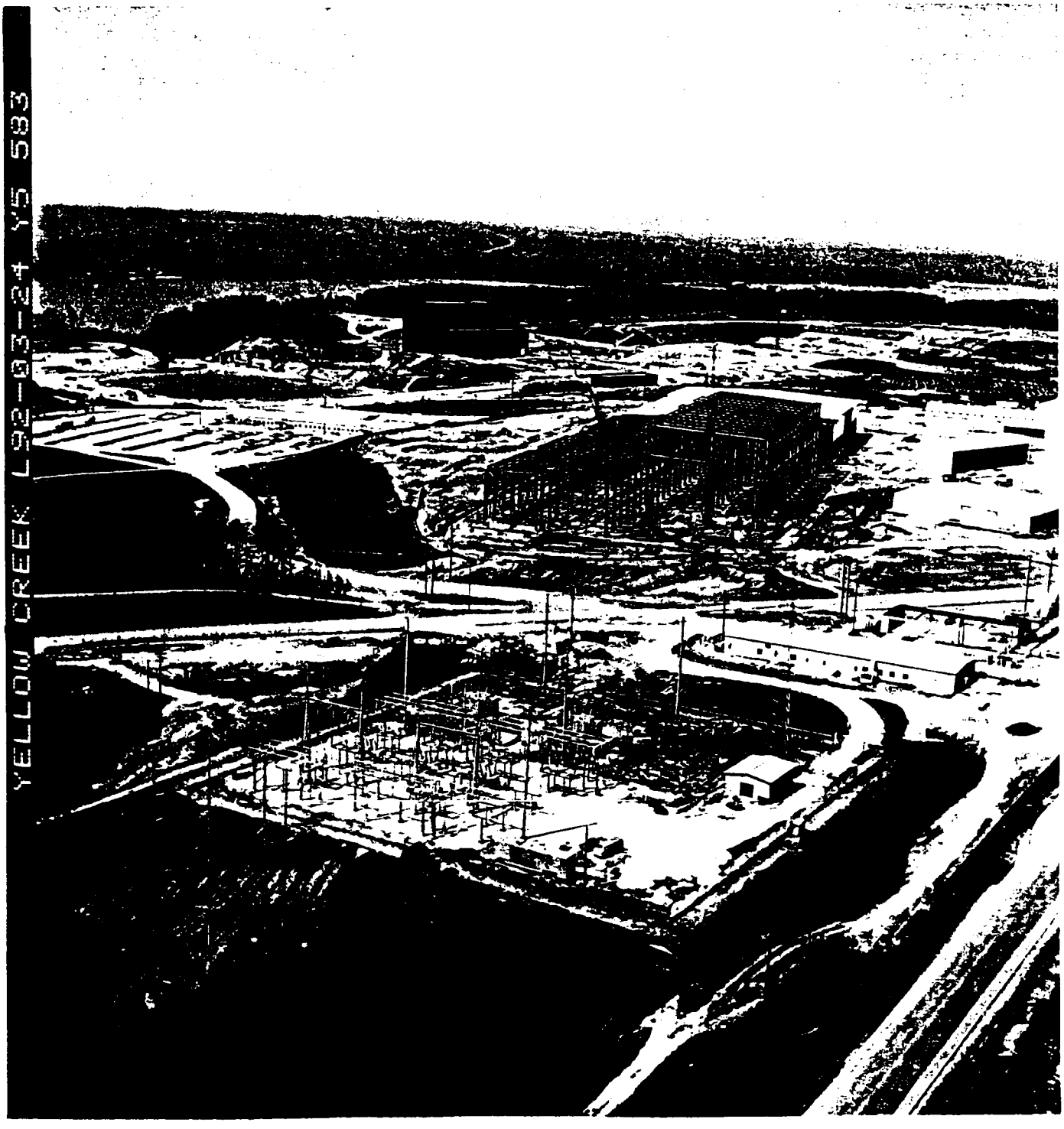
Diameter/Length, in	**150/1,513.43**
Average Thrust Vacuum, lbf; Web time	**2,654,776**
Delivered Isp Vacuum, sec	**268.1**
Area Ratio, (Ae/At)	**7.48**
Motor Weight, lb	**1,351,092**
Propellant Weight, lb	**1,209,589**
Motor Propellant Mass Fraction, (Wp/Wt)	**0.895**
Inert Weight , lb	**141,503**
❑ Metal Case Weight/Number of Segments, lb	98,553/3
❑ Single Nozzle Weight, lb	18,800
Solid Propellant Type	**HTPB**
Average Chamber Pressure, psia; Action Time	**612**
Burn Rate at 625 psia, in/sec	**0.350**
Action Time, sec	**130.9**
Thrust Vector Control	**Flexible Bearing**
Recovery/Reuse	**Yes**



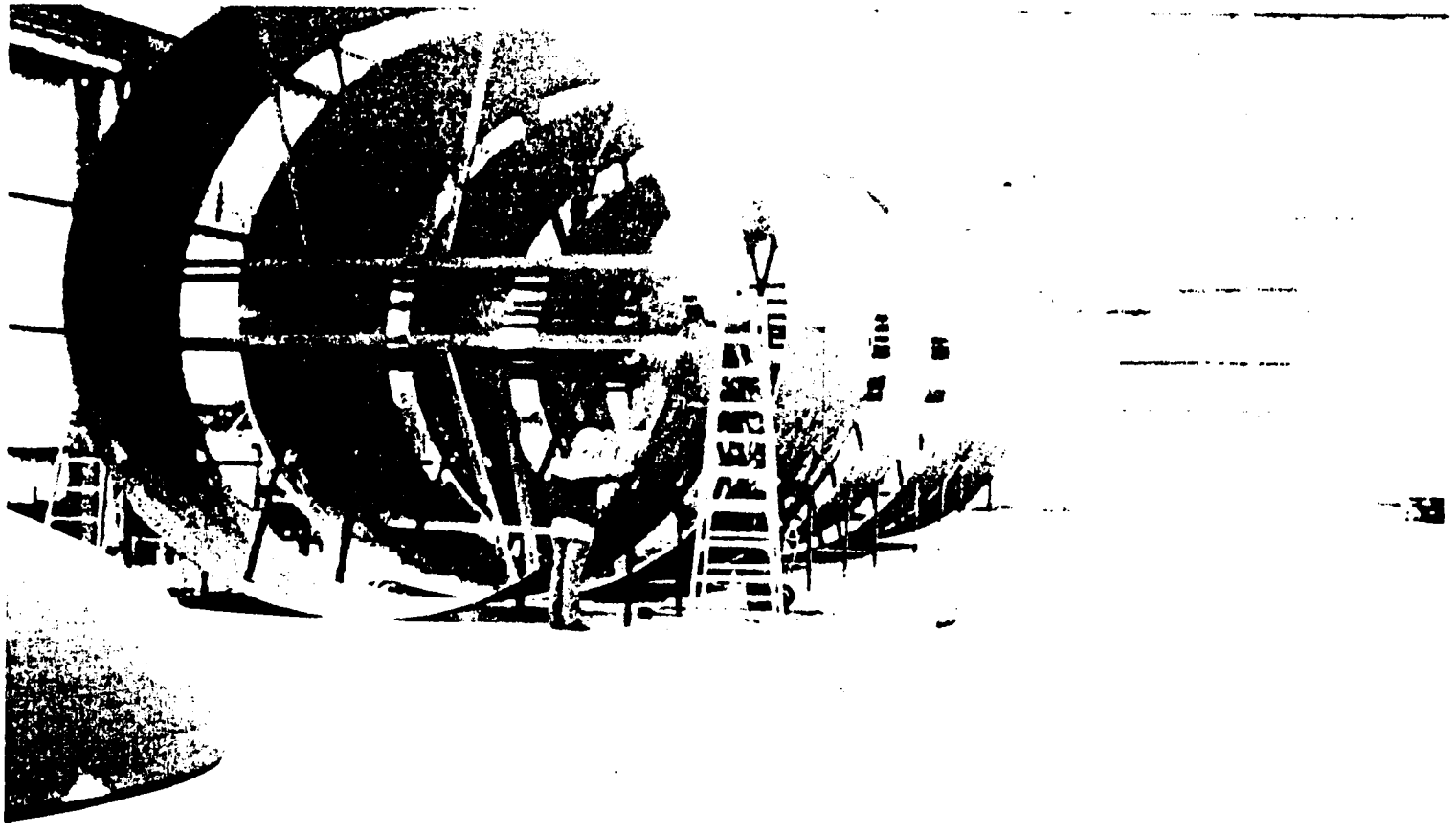
YELLOW CREEK



CASE PREP BUILDING

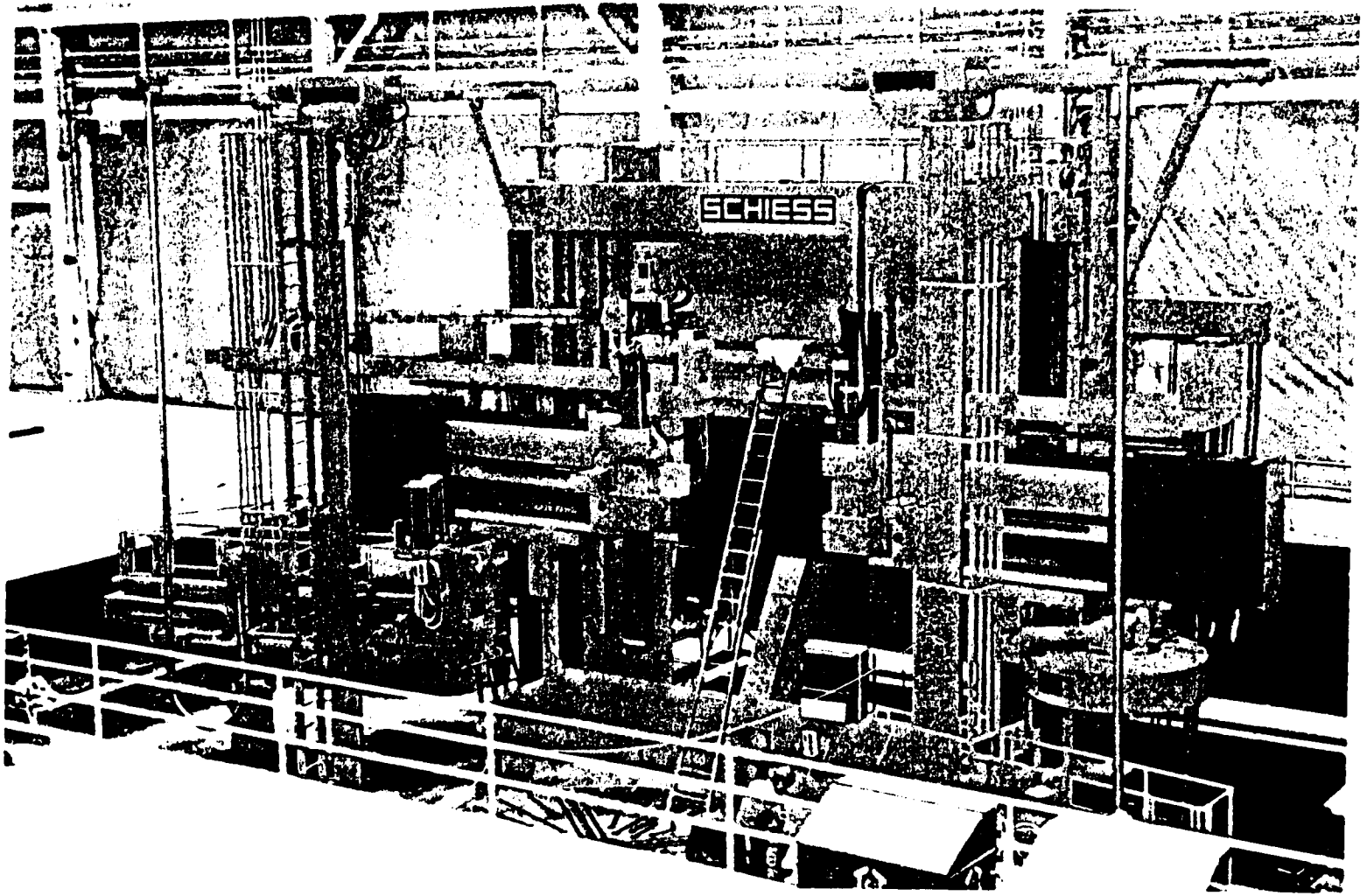


CASE PREP AUTOCLAVE
ON-SITE FABRICATION AT YELLOW CREEK

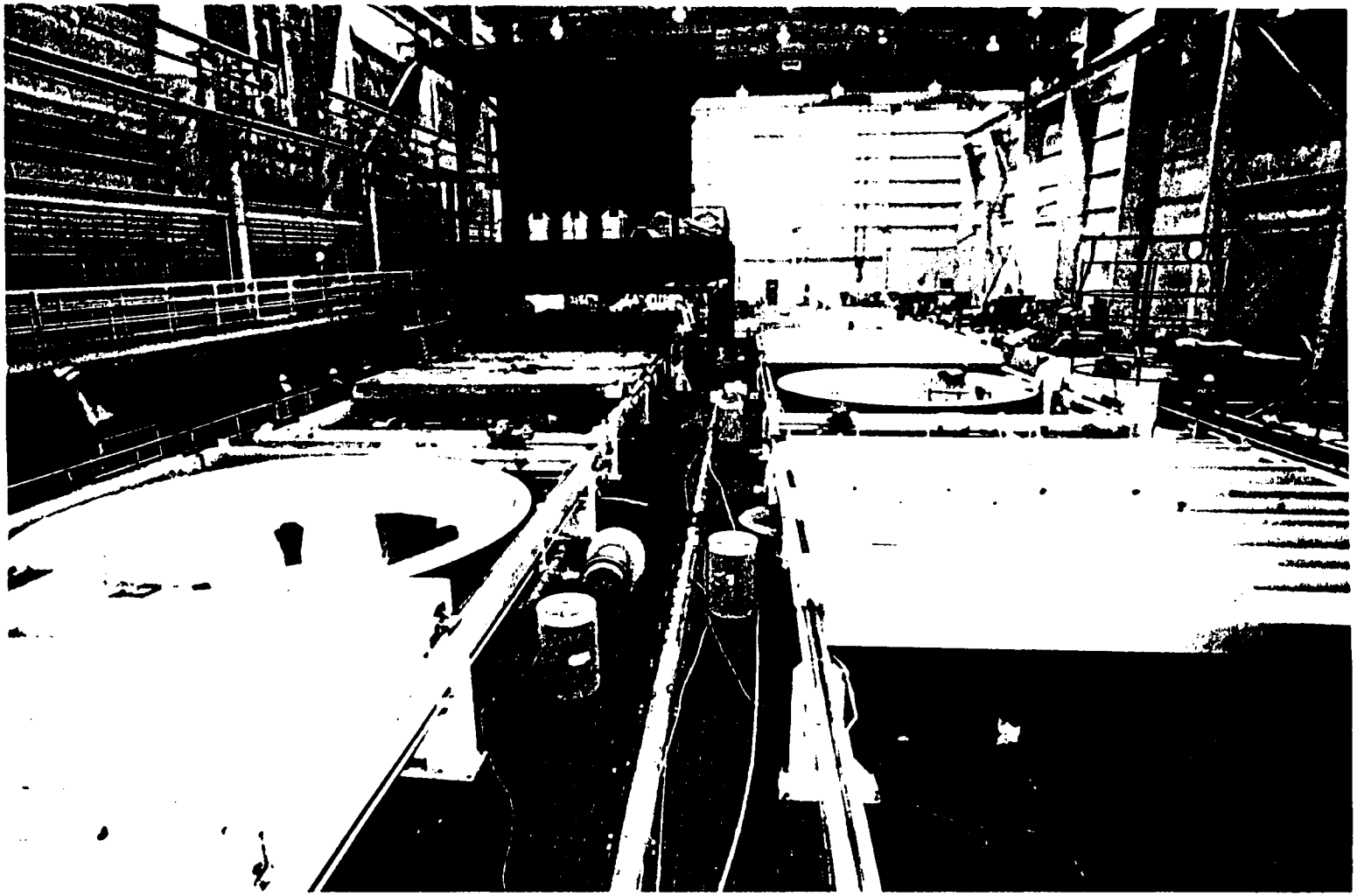


MICHOUD PILING AND PERIMETER WALL

VERTICAL BORING MILL (VBM)



HEAT TREAT/CHILLER BUILDING



SSC ASRM TEST SITE

ASRM TECHNICAL TOP 5
March 27, 1992

1. Mix/Cast Construction, Outfitting & Process Verification
2. Soluble Casting Mandrels
3. Integration Effects; P_C Dot; Loads; Recovery; Overpressure; Moldlines
4. Low-Density Nozzle Ablatives Performance
5. Forward-Facing Cast Inhibitor

SOLUBLE CORE DESIGN