AN EXAMPLE OF ECONOMIC VALUE IN RAPID PROTOTYPING

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RAPID PROTOTYPING

• TODAY'S MODERN MACHINING PROJECTS ARE COMPOSED OF MORE AND MORE COMPLICATED AND INTRICATE STRUCTURE DUE TO A VARIETY OF REASONS INCLUDING THE ABILITY TO COMPUTER MODEL COMPLEX SURFACES AND FORMS
RAPID PROTOTYPING

• THE COST OF PRODUCING THESE FORMS CAN BE EXTREMELY HIGH NOT ONLY DOLLARS BUT IN TIME TO COMPLETE.

• CHANGES ARE EVEN MORE DIFFICULT TO INCORPORATE
RAPID PROTOTYPING

- PICTURE OF THE SUBJECT BLADE
RAPID PROTOTYPING

• THE BLADE SHOWN IN THE PREVIOUS SLIDE IS AN EXCELLENT EXAMPLE

• ITS COMPLEX FORM WOULD HAVE REQUIRED HUNDREDS OF HOURS IN FABRICATION FOR JUST A SIMPLE PROTOTYPED
RAPID PROTOTYPING

• AFTER A SERIES OF COMPLEX DRAWINGS WERE ASSEMBLED A PROCUREMENT WOULD HAVE BEEN INITIATED TO MACHINE A PROTOTYPE BLADE OR TO BUILD A COMPLEX DIE FOR THE PRODUCTION OF WAX FORMS FOR THE CASTING PROCESS.
RAPID PROTOTYPING

• THE PROCUREMENT WOULD HAVE TAKEN IN THE NEIGHBORHOOD OF 6 WEEKS TO COMPLETE

• THE ACTUAL FABRICATION WOULD HAVE BEEN AN EQUAL AMOUNT OF TIME TO COMPLETE
RAPID PROTOTYPING

• AN ALTERNATIVE TO THIS PROCESS WOULD HAVE BEEN A WOOD MODEL. ALTHOUGH CHEAPER THAN A METAL FABRICATION IT WOULD BE EXTREMELY TIME INTENSIVE AND REQUIRE IN THE NEIGHBORHOOD OF A MONTH TO PRODUCE IN-HOUSE.
RAPID PROTOTYPING

• JUST A ROUGH ESTIMATE WOULD PUT COSTS AT NEAR $32,000 RANGE WITH 2 TO 3 MONTHS TO PRODUCE A USEABLE PRODUCT
RAPID PROTOTYPING

• WITH THE SINTERSTATION 2500 PLUS ALL THAT WAS REQUIRE WAS TO:
  – A SOLID MODEL FROM A CAD/CAM SYSTEM DOWNLOADED AS A STL FILE
  – LOAD THE FILE TO THE MACHINE
  – 2 TO 3 HOURS OF SET UP TIME
  – 16 HOURS OF UNATTENDED RUNNING

• TOLERANCES OBTAINED ARE TYPICALLY 0.005 TO 0.010
RAPID PROTOTYPING

• THE BUILD CHAMBER IS ABOUT 12” X 13” X 17”
  – THE CHAMBER IS FILLED WITH DURAFORM POWDER
  – A NITROGEN BLANKET IS APPLIED
  – POWDER BECOMES SELF-SUPPORTING
RAPID PROTOTYPING

• A 100 WATT CO2 LASER IS SCANNED ON THE SURFACE OF THE POWDER
  – EACH PASS OF THE LASER ADDS 0.004” LAYER TO THE MODEL
  – THE PART IS BUILT FROM THE BOTTOM UP IN AN INCREMENTAL FASHION
RAPID PROTOTYPING

• UPON COMPLETION THE PART IS SIMPLY SEPARATED FROM THE SURROUNDING POWDER BY A SIMPLE SHAKEOUT

• THE PROCESS IS NEAT, CLEAN, SAFE, AND ENVIRONMENTALLY FRIENDLY

• COST TO PRODUCE < $7000!
RAPID PROTOTYPING

• HERE ARE SOME OTHER SUCCESS STORIES
RAPID PROTOTYPING

• THE BENEFITS ARE IMMEDIATE
  – THE PARTS ARE VISUALLY CLEAR TO ALL
  – ANY NEEDED MODIFICATION CAN BE SEEN IN DETAIL
  – TIME CONSUMPTION IS MINIMAL
  – EXTENDED PROCUREMENT PROCESSES ARE AVOIDED
RAPID PROTOTYPING

• GLENN RESEARCH CENTER HAS RECENTLY ORDERED AND WILL HAVE AVAILABLE LATER THIS YEAR A DMDS LENS TECHNOLOGY THAT WILL GIVE US A DIRECT METAL SINTERING CAPABILITY