

VIP Club – Roseville MN 14 October 2010

MINNESOTA'S HIDDEN HISTORY IN COMPUTING

# Origins in the Engineering Research Associates



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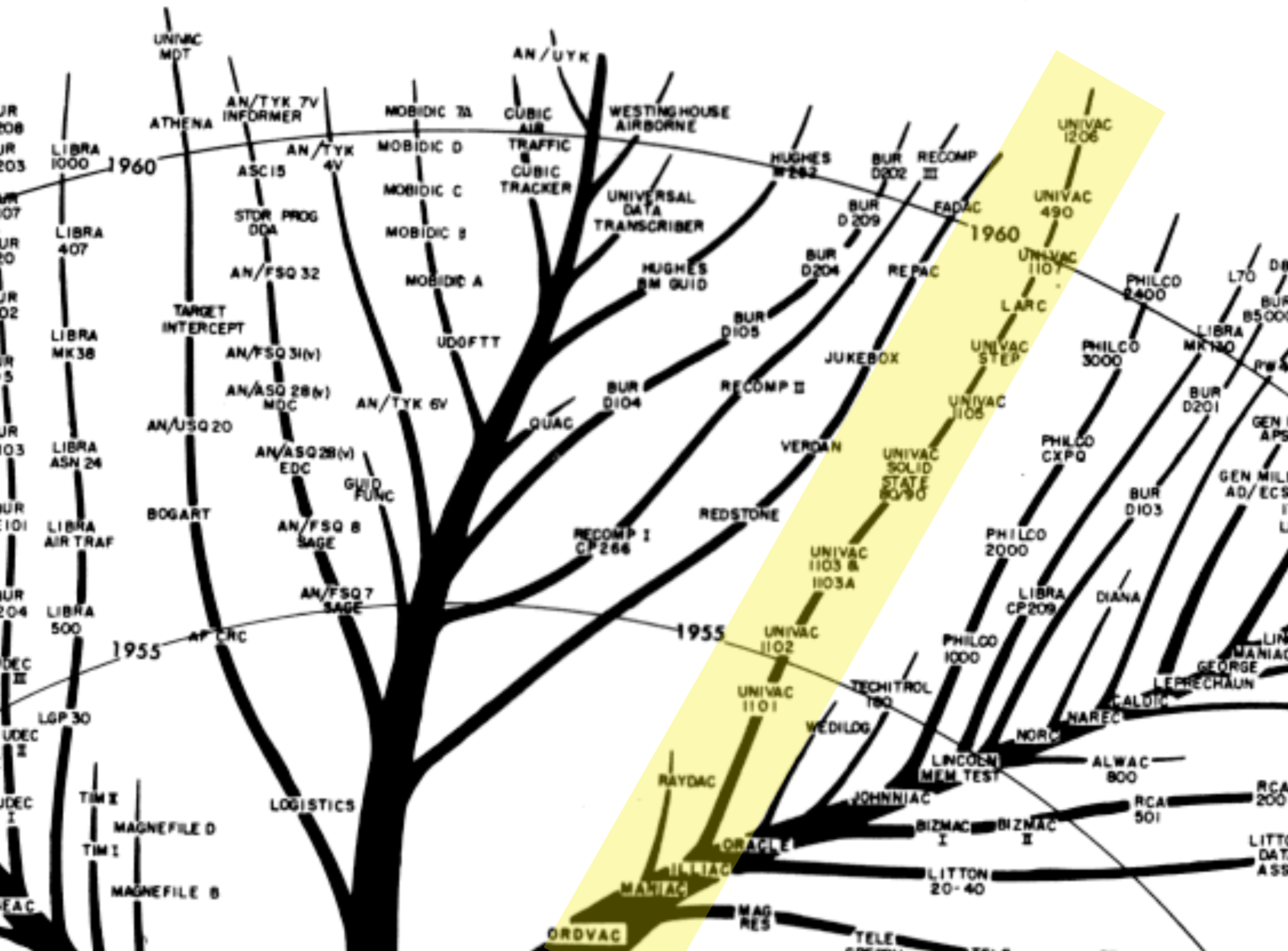




# ENIAC 'tree'



<ftp.arl.army.mil/ftp/historic-computers>





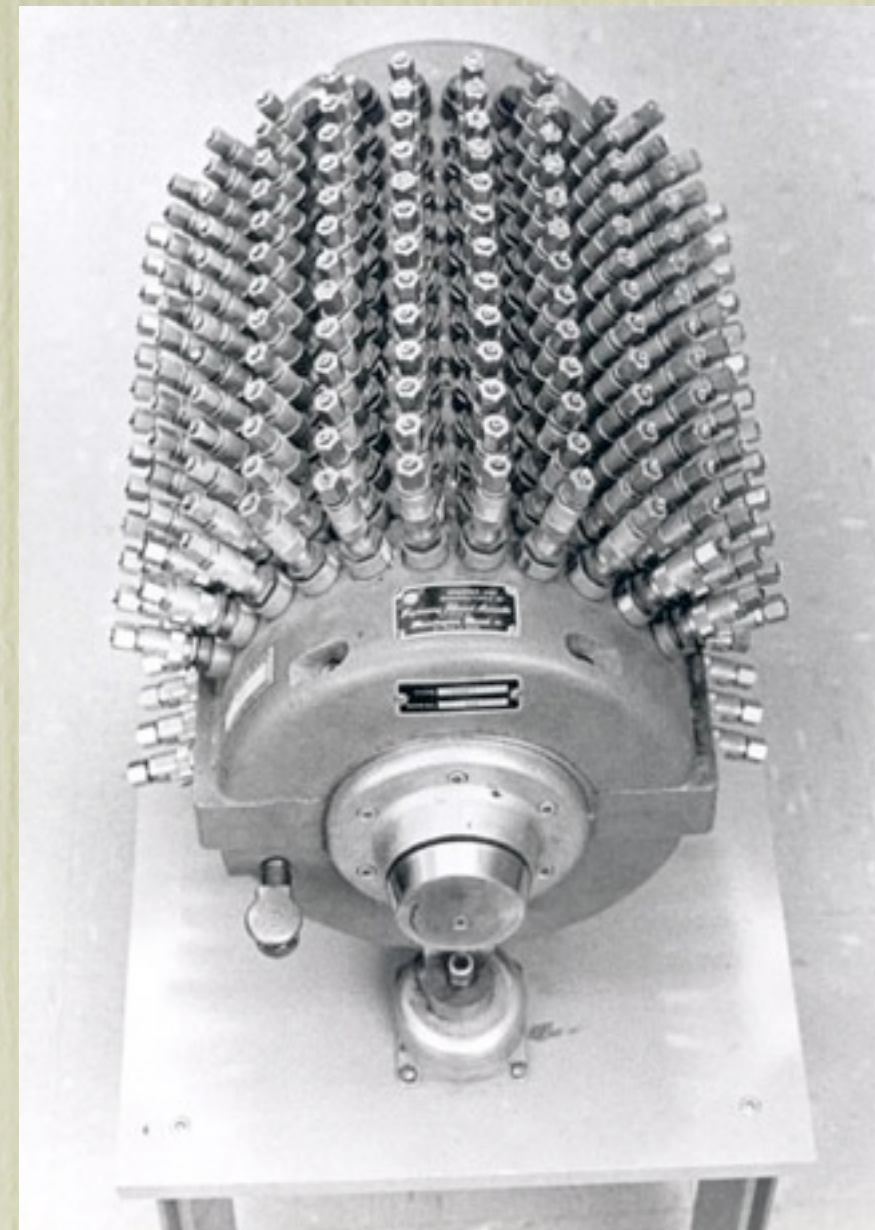
# Topics tonight

1. MN as 'silicon valley'?
2. Origins of ERA
3. Start-up days
4. Work and people at ERA
5. The RemRand (Sperry-) years
6. Legacies of ERA



# *MN's many computer 'firsts'*

- ... magnetic data storage
- ... 'stored program' computer
- ... computer industry
- ... 'supercomputer' [CDC to IBM–Rochester BlueGene]
- ... early WWW [Gopher . . .]



ERA drum memory unit [c.1950]



# *MN computer employment 1989*

- Massachusetts (4.1%)
- Minnesota (3.3%) = 68,000 jobs
- California (2.8%)
- Virginia (2.2%)
- Texas (2.1%)

► Percent state employment

Source: *Minnesota Technology* (Fall/Winter 1991)



# Origins of ERA

- Communications  
Supplementary  
Activity–W (Navy  
crypto 1943–46)
- Howard Engstrom  
(Yale math prof)
- William Norris  
(ex-Westinghouse)
- “set up a private company...?”



3801 Nebraska Ave NW  
Mt Vernon Seminary (1917–42)  
CSA–W et seq. (1943–95)  
Homeland Security HQ (2001–)

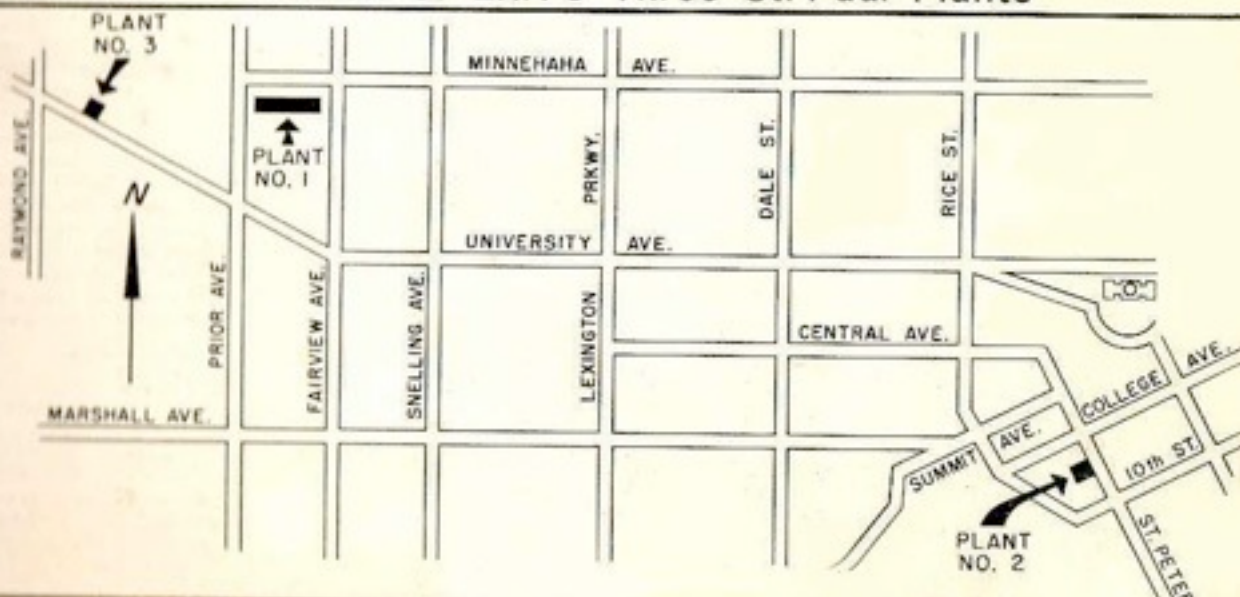


# Origins of ERA

- Sec/Navy James Forrestal: keep CSAW together post-war
- Wall Street: “plan unsound”
- John Parker - DC investment banker
  - Northwest Air board member
  - Northwestern Aeronautical Corp (1942-45)



Location of ERA's Three St. Paul Plants



# ERA origins

ERA plant #1  
1902 W. Minnehaha Ave





# ERA origins

- ‘Engineering Research Associates, Inc.’  
formed Jan 1946: DC office + St.Paul factory
- 2x 100k shares at 10¢ → \$20k capital
  - 50% ‘associates’ (HE + WN + 47)
  - 50% Parker investors + \$200k credit
- Parker + VPs Engstrom, Norris, Meader
- NCR Naval Computing Machinery Lab  
(Dayton) to ERA (St.Paul)



# ERA as start-up

- Navy contracts 6/1946 et seq. “tasks”
- Goldberg = magnetic drum data schemes
- Demon = specific Soviet code
- Moore School 1946, Harvard ‘47, MIT ‘47
- “status of computing machine components” [1947-8] → ERA book





# ERA as start-up

- Navy 'Task 13' design 8/1947; build 3/1948  
"Atlas" = magnetic drum computer
- Fall 1950 completed; Atlas sent to 'NSA' and  
working 12/1950 + 3/1953 (38 x 20 feet)
- drum memory 8.5 in diameter, 3500 rpm, 200  
read-write heads; 16,384 24-bit words (~48 K).
- 2700 tubes; 2385 crystal diodes; only 16 'down'  
hours in first 500
- "first" US stored-program? *LMCo new data*





# ERA as start-up

- Souped-down Atlas as ERA '1101' (Jack Hill)
- 400kc (vs. 1Mc)



ERA 1101 (#3) given to Georgia Tech 1954; here [1961]



# ERA as start-up

- IBM contract [1949] on magnetic drum
  - 2 “massive” patents to IBM
  - “pitifully small” royalties for ERA
  - basis for IBM’s MDC → IBM 650 ...  
N=2000 [1953-62]



# ERA as start-up

## MAGNETIC STORAGE SYSTEMS



You can now replace storage relays, stepping switches, punched tape, and other bulky forms of storage with an ERA Magnetic Drum Storage System. When used to store commands and other information for automatic machines, ERA Magnetic Storage Systems provide the reliability, the storage capacity, the economy in dollars and in space, and the high-speed operation required in many modern applications.



*Engineering Research Associates, Inc.*

ST. PAUL, MINNESOTA

ARLINGTON, VIRGINIA

The Leader In The Field  
Offers A Complete Family Of

## MAGNETIC STORAGE DRUMS

*Remington Rand*

ENGINEERING RESEARCH ASSOCIATES DIVISION



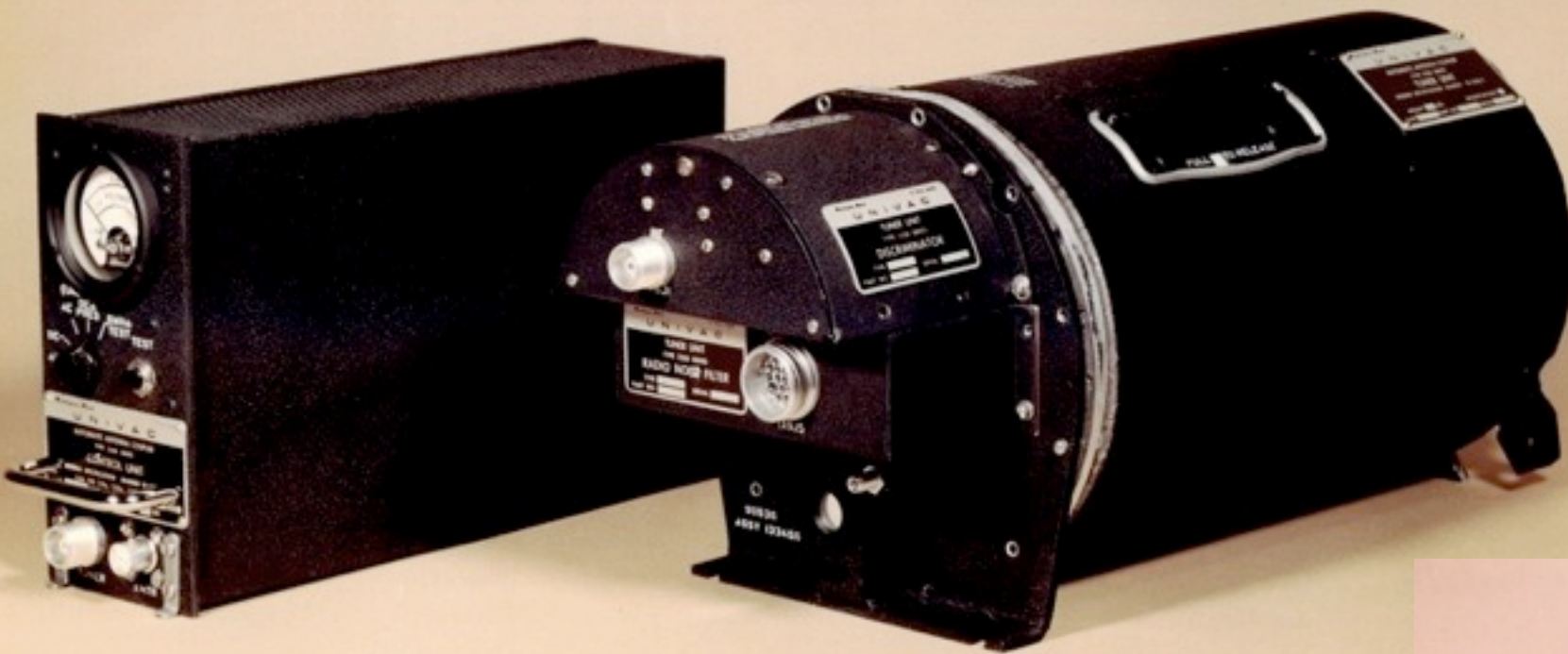
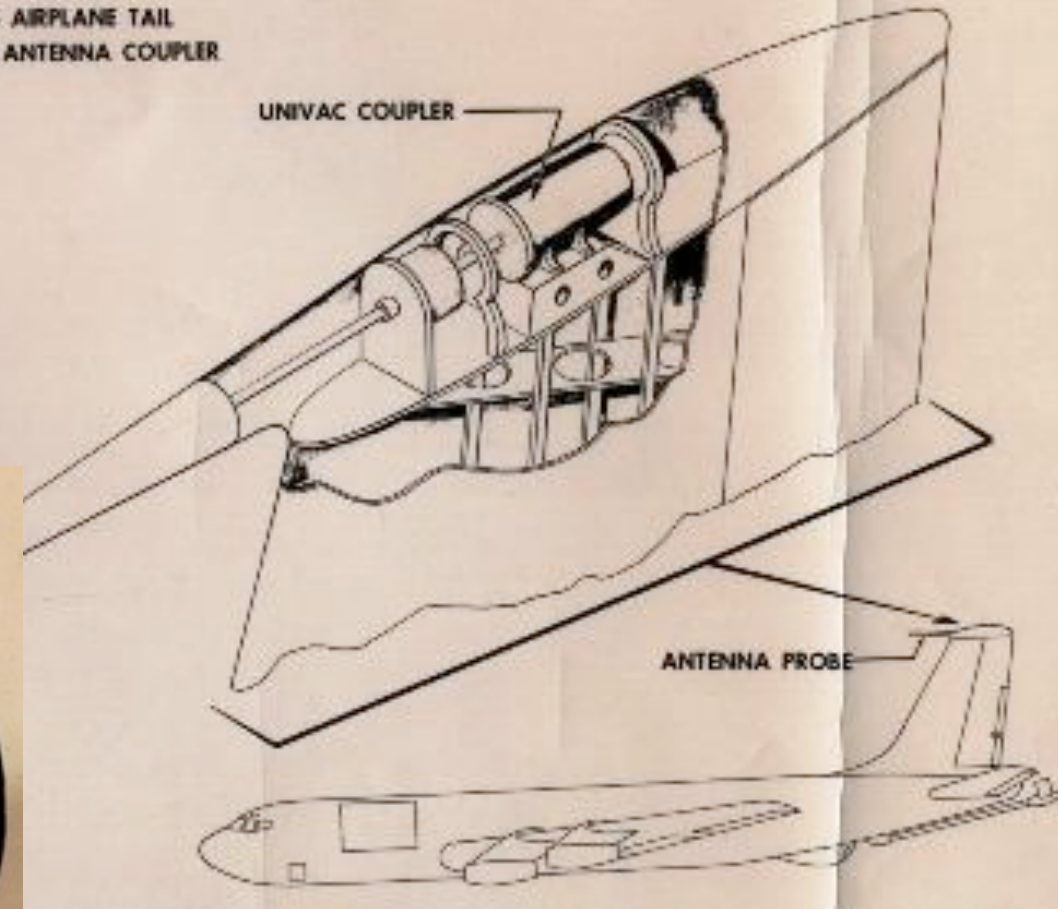


# ERA as start-up

## Air Force contract [1949]

### “antenna coupler”

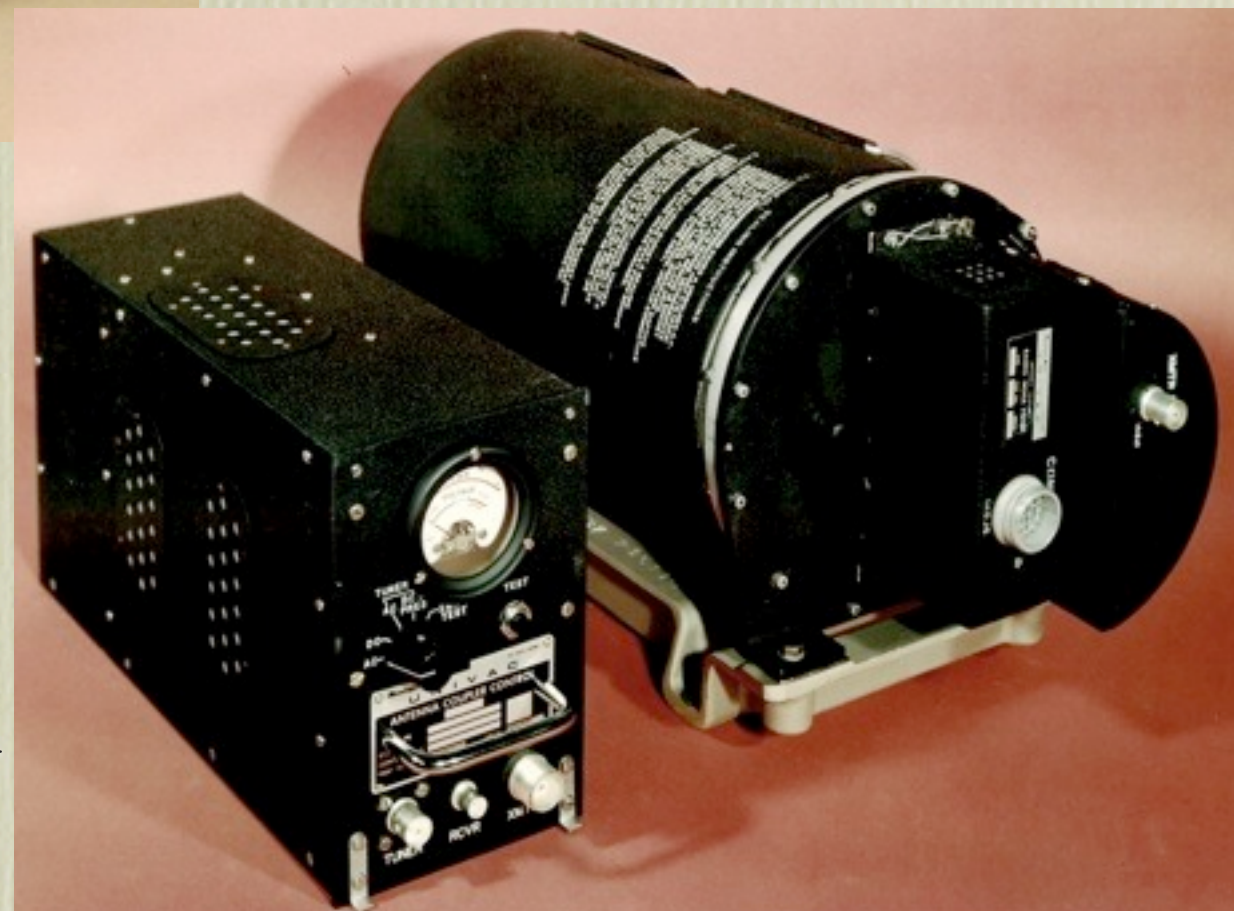
CUTAWAY SECTION OF KC-135 AIRPLANE TAIL  
SHOWING LOCATION OF UNIVAC ANTENNA COUPLER



Antenna coupler: KC-135 +  
B-707 aircraft

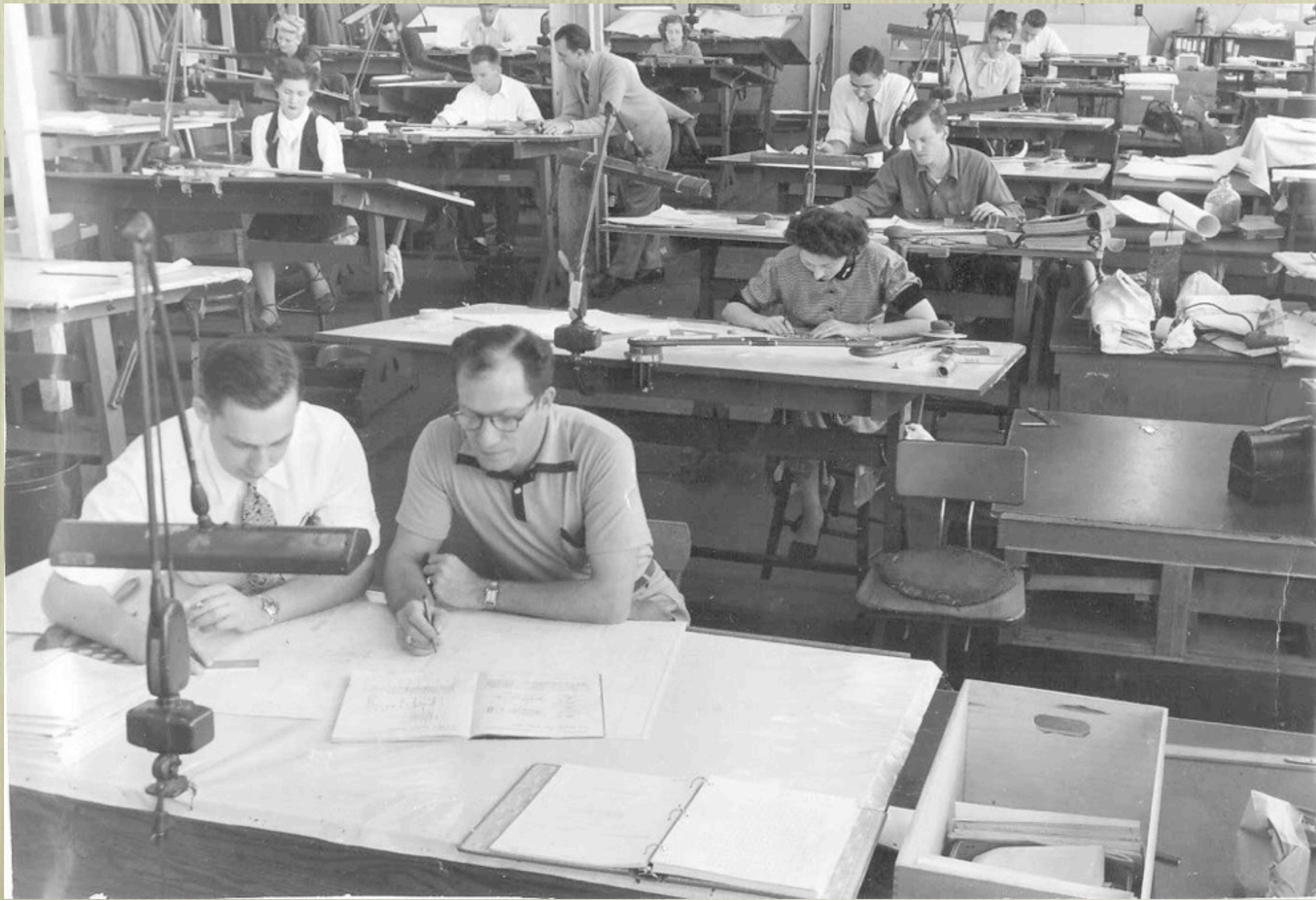
Antenna coupler  
ARC-58: B-52 aircraft

Antenna couplers = 12,000 [1953-70]  
<[vipclubmn.org/couplers.aspx](http://vipclubmn.org/couplers.aspx)>





# Work and people at ERA





# Work and people at ERA



Erwin Tomash (L) +  
Arnold Cohen  
(physics PhD—circuits)

John L (Jack) Hill

1909-2009

Atlas+II01 project supervisor





# Work and people at ERA

Sidney Rubens  
physics PhD—magnetic  
storage



JH Boekhoff (L) director  
of development greets  
Bill Drake



# Rem-Rand years

- RemRand buys EMCC 2/1950  
ERA 12/51 ... 5/52
- Atlas II → 1103
- 11/52 briefing  
“revealing [1103’s]  
existence” to  
RR’s “astounded  
executives”

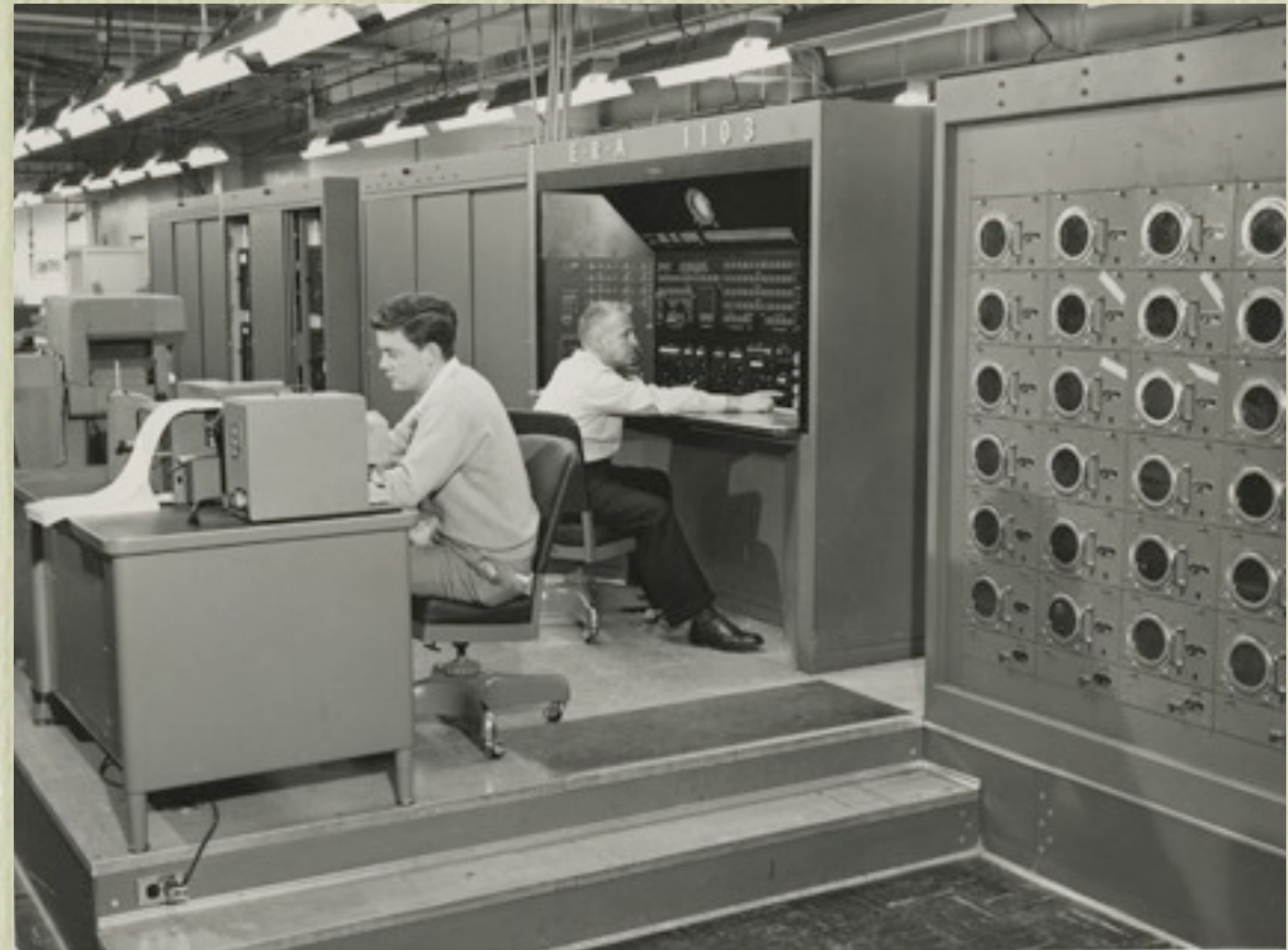


Ben Ferber (L) and Bob Price (R)  
[Dec 1954] Convair - General Dynamics



# Rem-Rand years

- 1103 announced 2/53
- total ~20 sold
- *new* manufacturing
- *weak on* pricing, rentals, customer training, field service
- *no* applications, field support ... ‘glaring deficiency’



Bob Price (L) [15 Dec 1954]  
“This is about half of {1103}”  
Convair GD



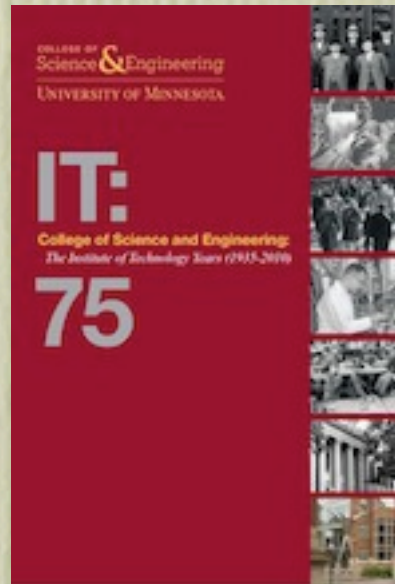


**Marvin Stein (2007)**

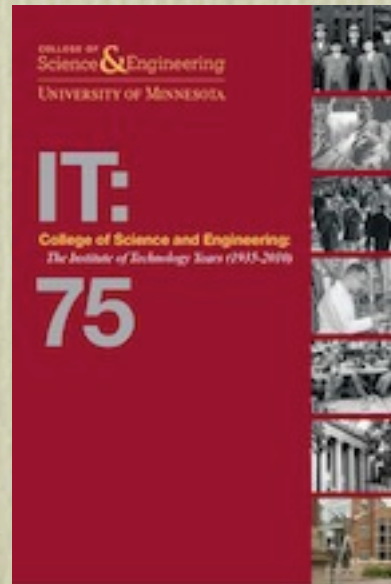
**Dedication of Numerical Analysis Center (3 June 1958).  
Left to right: President James Morrill, Marcel Rand, Jerry Shepherd, Kenneth R. Herman**



# Misa et al. on University's College of Science and Engineering: The Institute of Technology Years (1935-2010)



Hard cover



Paperback

Now on Lulu.com [click ↑];  
soon on Amazon, BN.com, etc.

COLLEGE OF  
Science & Engineering  
UNIVERSITY OF MINNESOTA

IT:

College of Science and Engineering:  
*The Institute of Technology Years (1935-2010)*

75





# Rem-Rand years



- $\Rightarrow$  Sperry-Rand [1955]
- UNIVAC Division
  1. EMCC (Philadelphia)
  2. ERA (St Paul)
  3. Rem-Rand tab machine (Norwalk CT)
    - “work ... not coordinated or integrated”
- St. Paul engineering on Univac II [1958-]
  - 5,200 tubes + 1,200 transistors + 18k crystal diodes + 184k magnetic cores





# Legacies of ERA

- ERA ▶▶ IBM 650  
...*“secured IBM’s leadership of industry”*
- 20+ start-ups from ERA veterans
- Control Data [1957]  
→ 45 start-ups, spin-offs, ventures
- Dataproducts [1962]  
→ Erwin Tomash ➡ CBI [1978/80]
- [Seymour] Cray Research [1972]  
→ Cray Computer [1989]  
→ SRC Computers [1996]



# Engineering Research Associates [1946]



Ramsey Engineering [1953]

General Kinetics [1955]

Northport Engineering [1956]

Midwest Circuits (later Fabri-tek) [1957]

Transistor Electronics [1957]

Control Data [1957] → 45 spinoffs

<vipclubmn.org  
/Legacy3.aspx>

Data Display [1958]

General Magnetics [1959]

National Connector, Flortronics, Nuclear Data,

Whitehall Electronics, Electro-Med Inc. [1960]

Data Management Inc., Theradyne Corp., Minneapolis Scientific Controls [1961]

Aries Corp., Dataproducts, Tronchemics Research Inc. [1962]

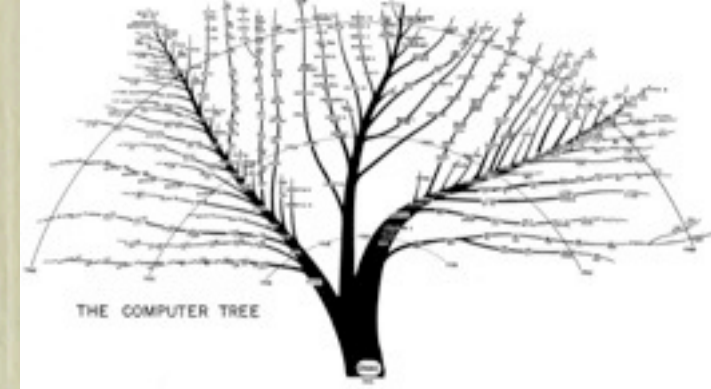
Wiesmantel Associates [1965] | Analysts International [1966] | Atron, Comcet, Comserv [1968] |

United Software, Dicomed [1969] | Community Electronics [1970] | Printware Inc [1985] | InfoPet

[1991] | Product Development Association [1994]



# ERA 'tree'



## Engineering Research Associates

Remington-Rand  
[1952]



(29 spinoffs)

Control Data [1957]



45 spinoffs +  
ventures

Sperry-Rand  
Univac [1955]

Sperry Univac  
[1979]

*Sperry + Burroughs =*  
Unisys (commercial)  
[1986-present]

Cray Research [1972]

Unisys Defense  
Systems [1986]

Cray Computer [1989]

Paramax [1991]

SRC Computers  
[1996]

Loral [1995]

Lockheed-Martin  
(Eagan) [1996]

[<vipclubmn.org/lmcolegacy.aspx>](http://vipclubmn.org/lmcolegacy.aspx)



# More on MN's 'hidden history'

- Nov 08: Control Data
- Dec 08: Univac to Unisys
- Jan 09: Honeywell
- Feb 09: IBM-Rochester
- Mar 09: 'Medical Alley'
- Apr 09: Internet Gopher
- May 09: IBM's Blue Gene [EECS/Keller]



[www.cbi.umn.edu/resources/MHHC/](http://www.cbi.umn.edu/resources/MHHC/)



# CBI resources

- Oral Histories (N=29)

AJ Ryden, WK Drake, AA Cohen, E. Tomash, JE Thornton, WL Anderson, ML Stein, WW Butler, JE Parker, SM Rubens, JL Hill, FC Mullaney, WC Norris

- ERA-RR-Sperry Rand Records (CBI 176) + *Hagley*

Warren Burrell 1945-70

Jay Kershaw 1955-65

John L Hill 1947-81

- Arthur Norberg's *Computers and Commerce* (MIT 2005)

