would be freezing of a given species ($x_i$ = constant), two species having a given ratio, or whatever other information or prejudices one has about linear relations among the $x_i$ This approach could be extended to the use of inequalities by using a nonlinear optimization routine[3] to minimize the Gibbs free energy, subject to lineaı equality or inequality constraints

### References

[1] Bahn, G S , "Thermodynamic calculation of partly frozen flows," AIAA J 1, 1960–1961 (1963)

[2] White, W B , Johnson S M , and Dantzig, G B , "Chemical equilibrium in complex mixtures, ' J Chem Phys 28, 751–755 (1958)

[3] Rosen, J B , "The gradient projection method for nonlinear programming Part I Linear constraints," J Soc Ind Appl Math 8, 181–217 (1960); a program in FAP language for this approach is available as SHARE No 1399

## Comments on "Wing-Tail Interference as a Cause of 'Magnus' Effects on a Finned Missile"

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and

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SINCE the publication of Ref 1, the present authors have had several private communications about their differences concerning the magnus effects on a finned missile [2] We find that our views actually are not too far different, and we have been able to reach agreement on the major issues The following is being published in order that the picture of the aerodynamics of a rotating wing will be clarified

1) The angle of attack and the lift distribution on a rotating wing have spanwise variations that are dependent on the rotation helix angle $\omega r/U$

2) The integrated lift on the wing and the lift distribution can be obtained from

$$L = \int_{a}^{a_+ s0} qC_{L\alpha}\left(\delta - \frac{r\omega}{U}\right) C(r)dr$$

where

$q$ = dynamic pressure
$C_{L\alpha}$ = stationary wing lift curve slope
$\delta$ = wing deflection angle
$r$ = spanwise distance from the center of rotation
$\omega$ = rate of rotation of the wing
$U$ = forward velocity of the wing
$C$ = wing chord $C = C(r)$ which is dependent on the wing geometry
$a$ = distance from the rotation centerline to root chord
$s_0$ = distance between root chord and tip chord

3) The exact integrated lift and lift distribution cannot be determined until the wing geometry is fixed When the wing is in a free-spin condition, the net rolling moment is

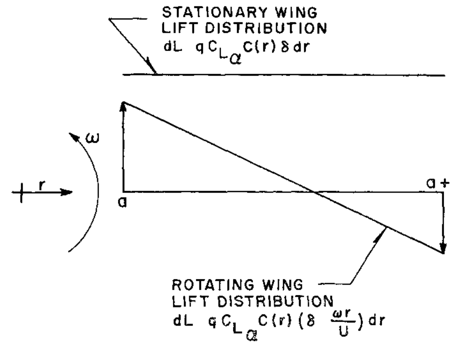


**Fig 1 Compaıison of the lift distribution on a stationary and a rotating wing**

zero, $\int rdL = 0$, and the integrated lift can be shown to be small for any conventional wing (10 to 20% of the stationary lift) Also, the spanwise lift distribution can be approximated and is compared with the stationary wing lift distribution in Fig 1 If only the integrated lift is considered in the problem, then the rotation effect is small If the lift distribution along the span must be considered, then the rotation effects can be of prime importance

4) The change in the lift distribution due to rotation will alter the wake pattern aft of the wing and will change the wing-tail interference factors accordingly Also, the wing tail interference factors are a function of the tail position in the wing wake The assumptions of $\eta_d = 0$ and $\eta_b = 1$ [Eqs (31) and (32) of Ref 2] apparently work well for the case considered but may not work for the general case

### Refeı ences

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## Comment on "A Theoretical Interaction Equation for the Buckling of Circular Shells under Axial Compression and External Pressure"

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IN his note, Sharman[1] stated that he assumed $m = 1$ in the computations and reasoned that "assuming $m = 1$ restricts the valid solutions to positive external pressure only" The author believes that this reasoning is slightly erroneous, since it implies a jump in $m$ at $(p/p_0) = 0$ Sharman's reasoning demands that, as $(p/p_0) \to 0$, $m$ for minimum $\sigma_c$ remains unity, until at $(p/p_0) = 0$, the well-known case of pure axial compression, $m \gg 1$ Hence at $(p/p_0) = 0$ there are two possible configurations, one with $m = 1$ and one with usual $m \gg 1$, which seems unlikely

For clarification, some points were calculated (with similar parameters as in Ref 1) near the $R_c$ axis and the calculations indicated that there is indeed a narrow transition region, and

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